DRAGON USER



The independent Dragon magazine

95p US$3.25 April 1985

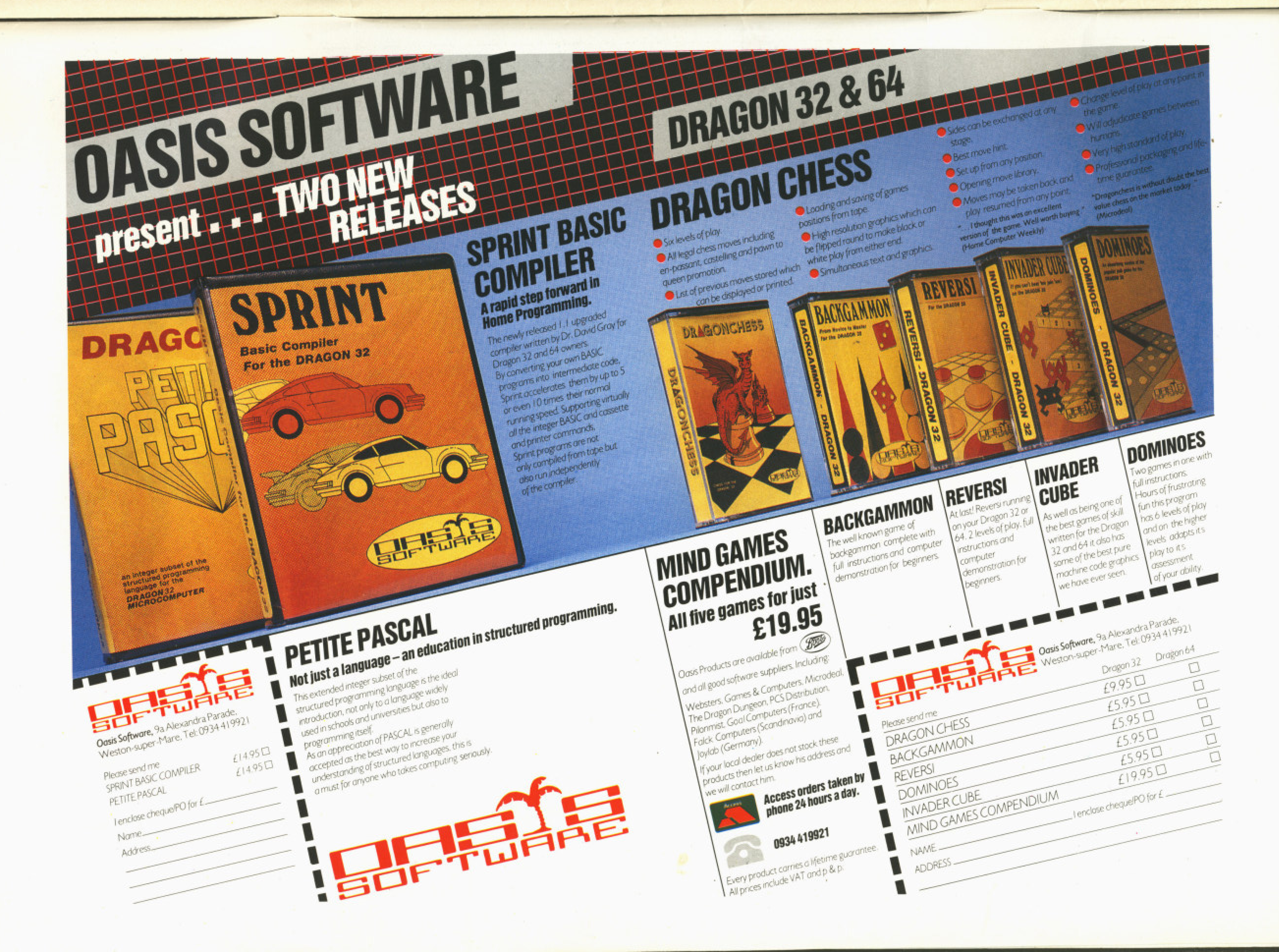
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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extent depend on the quality of the discoveries that you can make with your Dragon. The Dragon computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

HOW ARE THE mighty fallen! Acorn, once the darling of the Unlisted Securities Market, has been forced to restructure itself with financial aid from Italian giant Olivetti. Commodore UK has halved the price of its new Plus/4 micro and parted company with its general manager Howard Stanworth. Even Sinclair has cut back on production and postponed the US launch of the QL.

Nor is this phenomenon confined to the UK. Sord, once described as the "Japanese Apple", has been in discussions with Toshiba about possible investment. This follows a sharp drop in profits last year and a reduction in market share to little more than four per cent.

The micro market can fairly be described as "jittery" at the moment. The boom years of 1980-83 are over and no one is quite sure how big the market will be in future. This, in turn, has had a knock-on effect among book and software publishers.

Dragon users, of course, are quite familiar with this situation having experienced the troubles associated with Dragon Data's demise. Thus, they are well placed to advise their fellow micro owners that all is not "doom and gloom". Any machine which establishes a large user base will continue to be served by software and peripherals for some time, even if the manufacturer ceases to exist.

Hopefully, once excess production capacity has been shed, the market will settle down again. The question occupying most peoples' minds at the moment is just how much capacity is excess — no one is taking any bets on the answer.

Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Son et lumiere

I AM writing with reference to the Sound-to-Light program by Robert Strange published in *Dragon User* in January. This program can be improved by altering the following lines:

```
120 T=500
140 C=INT(A/7)
150 IF C=O THEN T=T*2.1
160 IF C>=8 THEN C=8:T=T*2.1
170 IF T>1100 THEN T=1100
180 IF ABS(A-E) <O THEN 130
210 E=A: IF E=O THEN CLSO
```

The program will now respond much faster to the changes in pitch in the music.

Peter Davis
95 Curzon Road
Bradford Moor
Bradford
West Yorkshire

Avoid the SAM sting

I RECENTLY had the misfortune to blow the 6883 SAM chip in my Dragon. The symptoms on cold start are a screen full of characters which are unaffected by inserting a cartridge, resetting, or using the keyboard.

Attempts to buy this semiconductor from my local dealers proved fruitless. All the dealers in an electronics magazine also failed to stock this item. Eventually, I found two electronic stockists who carried this chip. The sting was the price of £33.62.

An advertisement in an American magazine showed that I could obtain one cheaper in Silicone Valley. A Visa order placed on an After Eight phone call to DOKAY Computer Products in Santa Clara, Los Angeles and five days later the chip was delivered to my home for a total cost of £19 plus postage. Quite a saving!

Mike Corrigan
Formby
Merseyside

Readers' poll plea

I WONDER on what basis your software Top 10 is calculated? By far the best games for the Dragon (namely Tim Love's *Cricket* by Peaksoft, *Back Track* by Incentive and *Return of the Ring* by Wintersoft) have never even registered in this chart, which I should imagine is based on shop sales! Well, you try getting a new Dragon game in any shops?!

Surely, a better way would be to run a readers poll, a la *Popular Computing Weekly*, then I'm sure these great games would attain their rightful position at the top of the Dragon charts.

W Miles
37 Clarence Road
Fleet
Hampshire RG9 7AQ

TOP 10 charts and their accuracy, or lack of, have long been a subject of debate. But, it is true that many shops have shown a marked reluctance to stock new Dragon software following Dragon Data's demise. We would be very interested to know what other readers think about the idea of a readers' poll.

Sheffield shuffle

I THOUGHT I ought to write to correct a notice given in a recent issue of *Dragon User*. It concerns the Sheffield Dragon User group. Your last Dragon Clubnet showed us as the OS9 user group of Huddersfield.

I have had a number of calls concerning OS9 (which have been welcomed, since I actually use OS9 myself), but the club does not specialise in OS9. One of the calls was of interest, however, since the gentleman concerned was willing to answer further enquiries regarding OS9. His details are as follows:

Alan Kendrick
5 Henry Avenue
Havercroft, Nr Wakefield

I would be grateful if you could update our club details — we now meet only at Sheffield City Polytechnic (during term time) on the last Monday of each month. Incidentally, you may be interested to know that I have had enquiries from places such as Ireland and Germany! Your magazine certainly gets about.

Richard Crampton
Sheffield Dragon & CoCo Users Group
131 Herringthorpe Valley Rd
Rotheram

APOLOGIES TO the Sheffield Dragon User group for placing you in Huddersfield.

Americans Dragons

THIS IS a plea from an unknown number of Dragon owners in the USA. We have been left with no peripheral or software support after the Tano Corporation unsuccessfully tried to crack the overcrowded American marketplace.

Any articles aimed at US readers would be most appreciated. In particular, we need information on foreign mail order problems and on the possibility of interfacing Color Computer disk drives and controllers. Any personal information and advice from your readers would be welcomed.

Ricky Berkey
229 Elva
Anderson
IN 46014
USA

Software Top 10

1	(5)	**Chuckie Egg**	A & F
2	(4)	**Dragon Chess**	Oasis
3	(–)	**Frogger**	Microdeal
	(–)	**Cuthbert in Space**	Microdeal
	(7)	**Bug Diver**	M. Tronic
	(2)	**Mystery of Java Star**	Shards
	(–)	**Back Track**	Incentive
	(–)	**'O' Level Maths**	Ampsoft
9	(–)	**Dragon Fly**	Hewson
	(–)	**Pedro**	Beau Jolly
	(–)	**Database**	MST
	(–)	**Edit+**	Compusense

Chart compiled by Websters Software

Dragon miners

COULD YOU please tell me where I can get a copy of *Manic Miner* for the Dragon? I have searched everywhere, but failed to find it. Hope to hear from you soon.

Conor Wymberry

IF YOU can't find a copy in your local shops, you can always buy the game mail order from Software Projects, PO Box 12, Liverpool L25 7AF.

Key friend

I WOULD like to congratulate you on your excellent magazine *Dragon User*. It is a great relief to see a magazine devoted solely to the Dragon even though the company went bust. I buy a copy every month.

I am writing to ask you to publish my name and address as I would like a computer pen friend.

Andrew Bartlett
30 The Moors Drive
Middleton Cheney
Banbury
Oxon

Flex

RE GO FLEX by Brain Cadge — *Dragon User* February — this article was unfair in that Brian expressed a personal preference for OS9 which some readers have take as an unqualified recommendation. No factual comparison of OS9 and FLEX facilities were made to justify this opinion. Some of our customers, who have bought and used both systems, were outraged at such a shallow review. I note that a recent review by Radio West came down heavily in favour of FLEX and DBASIC.

I feel that you owe Dragon users a more detailed comparison of the two operating systems. Both have their virtues and are well worth examining in detail. It is a tribute to the power and versatility of the 6809 processor that two such excellent operating systems are available.

Stan Opyrchal
Compusense

SPEEDRACER

NEW FROM MICRODEAL

DRAGON 32/64 & TANDY COLOUR 32K

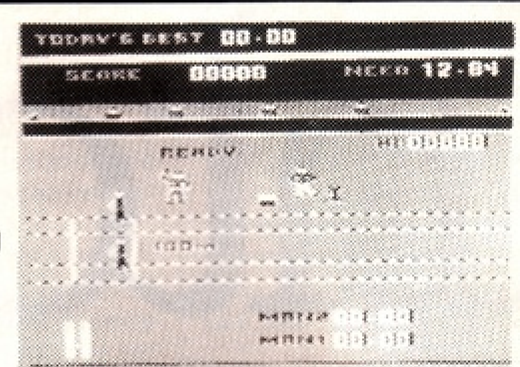
Atari & Commodore 64 owners, eat your hearts . . . this has got to be the best Grand Prix game ever. Fast action, super smooth scrolling "crisp" graphics, and loads of extras, such as . . . 4 circuits to choose from, a tyre change if they burn their tyres out too quickly, plus a set number of cars to pass in order to qualify. Its fast and very very good.

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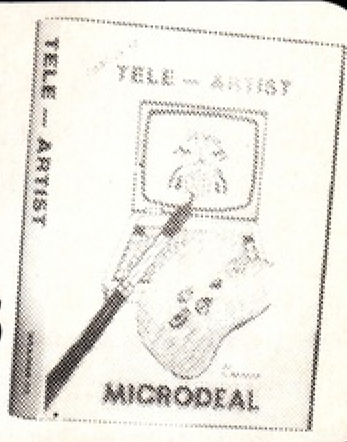
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6809 Show

THE SECOND 6809 Colour Show for Dragon and Tandy users will be held at London's Royal Horticultural Halls on March 30 and 31. Exhibitors will include Tandy, Microdeal, Compusense, Design Design, Blaby and Voltmace.

A new modem for the Dragon will be launched by Dealer Deals. The Demon modem can handle baud rates from 300 to 1200 and will cost around £50. The price of the accompanying software has not yet been fixed.

Dragon User will be exhibiting on stand No 45-46. There will be a wide selection of current and back issues of the magazine on display, together with a number of Dragon books from Sunshine, all for sale to the public.

Admission to the show, which will be open from 10 am to 6 pm, will cost £2 for adults and £1 for children under 12. Further information is available from the show organisers, Computer Marketplace (Exhibitions) Ltd, 20 Orange Street, London (Tel: 01-930 1612).



Last November's 6809 Show — busy as ever

Compusense imports Dragon 64s

EUROHARD has appointed London based Compusense as its UK Dragon distributor. Compusense is now shipping Dragon 64s and Dragon disk drives for sale in the UK. Single disk drives will cost around £240 and double disk drives about £450. The price of the Dragon 64 has been fixed at around £195. All prices inclusive of delivery.

Both the Dragon 64 and the disk drives will be on sale at the Compusense stand at the 6809 show on March 30 and 31 at London's Royal Horticultural Halls.

More information from Compusense, Box 169, 286D Green Lanes, Palmers Green, London N13 5XA

Jet Set Dragon

IF YOU have ever tried to climb the Banyan Tree, get under the Security Guard or perform a Quickafleeg, then the chances are that you have played *Jet Set Willy* on a Spectrum. Now, Software Projects is launching *Jet Set Willy* on the Dragon.

Jet Set Willy is the sequel to *Manic Miner* and again features the adventures of Miner Willy. The game is set in Willy's mansion and there are some 60 locations to explore, each with their own hazards and hidden surprises. Watch our for guards on the battlements and the entrance to Hades.

Matthew Smith's epic, which was converted to the Dragon by Roy Coates, costs £7.95 and is available from Software Projects, Allerton Road, Woolton, Liverpool L25 7SF.

Dragon roars

A SPEECH synthesiser for the Dragon is being retailed by J Morrison (Micros).

The Speakeasy synthesiser plugs into the printer port, and is powered from the micro. It has a built-in speaker, and will come with two software packages to demonstrate its capabilities.

The package will cost £24.95 from J Morrison (Micros), Dept DU385, 4 Rein Gardens, Tingley, West Yorkshire, WF3 1JR.



New releases

BLABY Computer games will be showing four new releases at the 6809 Show.

Copter Snatch, based on *Scramble, Star Swoop,* a version of *Galaxian,* and *Star Defence,* a *Defender* type game, are all £1.99.

The fourth game, *Hubert,* is a version of *Q-Bert,* and will cost £3.99.

John Bailiss, the company's managing director, says that a video display will be running full-time at the show to allow customers to take a look at the programs before buying.

A copy of the demo video has also been sent to Justo Alvarez of Eurohard.

Mysterious

THE Mysterious Adventure series originally released by Channel 8, will now be put out by Adventure International, publishers of the Scott Adams' range of adventures.

This follows the announcement that Brian Howarth, author of the Mysterious Adventures, has joined AI to head the programming team.

He will be working on Dragon conversions of the entire AI range — *Spiderman* will be next, followed by a *Gremlins* game.

The Mysterious Adventure games are £7.95.

Mastertronic

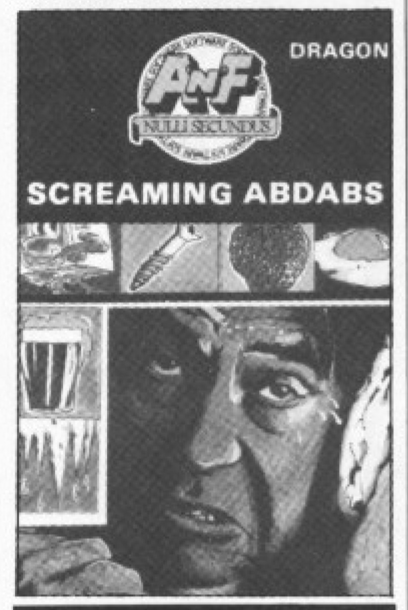
MASTERTRONIC is converting its successful one armed bandit simulation, *Vegas Jackpot,* for the Dragon. It will be in the budget range, at £1.99, and will appear towards the end of March.

Screaming Abdabs

LANCASHIRE BASED A&F Software has just released a new program for the Dragon — *Screaming Abdabs.* There are 35 complex screens, with various monsters, icicles, collapsing floors and other hazards to prevent you from reaching your goal.

Each screen contains a key which is necessary to access the next level.

The game, which costs £6.90, is available from A&F Software, Unit 8, Canalside Industrial Estate, Woodbine Street East, Rochdale, Lancashire OL16 5LB.



Incentive Confuzion

THE NEXT Dragon program from Incentive Software will be a version of the arcade game *Confuzion,* £6.95.

Ian Andrew, Incentive's managing director, says that *Confuzion* will be converted as soon as the programmer has finished the *Ket* Trilogy.

For more details, contact Incentive Software, 54 London Street, Reading RG1 4SQ.

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Artist

***Brian Hinson** explains how to turn your keyboard into an artist's palette*

ARTIST IS a program for all the family to enjoy! You can just doodle away to your hearts content, or you can use the save and load features to create screens for games and illustrations, using all the bright colours from your Dragon.

The program starts by clearing all the Dragon's high resolution screens. It continues by asking questions to set up the Pmode, Screen, Start page and Colours you want to use. The colours you choose for your background and pen must be from those available in the Pmode you have set, (refer to page 96 of the manual). Joystick or keyboard control is included. Keyboard control is easier to use for fine control but, joysticks are better for speed. Try experimenting for yourself.

You should now have a small flashing dot that you can move around the screen. Press 'C', for control, and the computer will 'Beep' whilst waiting for a command. Now press 'I', for ink, and the dot will leave a line of your pen colour. To change colour press 'C', followed by the code number for the colour you want, (eg. 4 = red in Pmode 3).

If you want a line at a difficult angle, or to join two points you need to enter 'Box' mode. Position the dot at one end of the line and press 'C' — 'B'. Dragon will remember this point. When you are ready, position the dot at the other end of the line required and press 'C' — 'B' — 'L', and your line will appear.

Box mode is also used to draw squares and rectangles. First register the starting point as before, then move to the diagonally opposite corner and press 'C' — 'B' — 'B'. Hey presto! a box. Make sure you have not left a hole at the corner and you can paint it. Move your dot inside and press 'C' — 'P' — followed by the number code for the paint you want, (eg. 2 = Yellow). Box mode is also used to pick up some part of your picture, however big, and PUT is elsewhere. As before register the diagonal corners, 'C' — 'B', then 'C' — 'B' — 'G' and the box will be remembered in array "F", (see line 90).

Did you know that you only need 1/32nd of the memory reserve the Dragon manual says you need for GET and PUT routines on pages 120/1? You don't need to worry about this to use 'artist', but for use elsewhere remember your array size need only be 'x' length multiplied by 'y' length divided by 32 and rounded up to a whole number. For example, the whole screen in Pmode 3 is 255 × 191 = 48705, divide by 32 to get 1522.03. So you could DIMension an array F (1523) to pick up a whole screen's worth!

Having GOT your detail, move the dot to the top left corner of the position you want to PUT it in and press 'C' — 'G' the detail appears. If you need another copy of the same detail you only need to PUT it with another 'C' — 'G' and the array will continue to hold the same detail until the next time you use 'C' — 'B' — 'G'.

To draw a circle, or ring, press 'C' — 'R' followed by the radius you want. As the control routine uses keyboard input direct I have used the ASC II value of the key pressed, less 48, so you can have a circle of radius from '1' to '2', (ie 1 to 74).

Made a mistake? Use 'C' — 'E' to obtain an eraser, and rub it out! Finished or want a rest? Press 'C' — 'X' and you will enter the save routine. You will now be offered a choice of tape or print dumps. The tape dump is supplied in listing 1, but you will have to add your own printer dump as a subroutine from line 1770 if you want this refinement.

To recall your picture for use in another program, include a line CLOADM "picture", and record the picture just after the program on the tape. Now your picture will auto load, probably much quicker than it could be drawn in Basic, and using less memory.

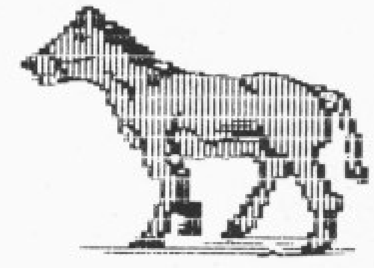
When you have become proficient at drawing you may wish to use the 'Perspective routine' to create three dimensional pictures. First, decide on the vanishing point, position the dot and press 'shift'. A target will appear and Dragon will remember its position even if you rub it out. From now on any time you want a line of perspective press 'shift'. You will have to rub out the parts of the lines you don't want and things can get a little confusing, but the results are super! If you are really advanced you can have two or more vanishing points by saving the part finished picture on tape, 'breaking' the program, 'run' and reload the picture and establish a new vanishing point. Have fun!

```
ARTIST by Brian Hinson.

10 '***********ARTIST************
20 '
30 '***A DRAWING PROGRAM FOR****
40 '***ALL THE FAMILY TO USE****
50 '
60 '*** BY brian hinson 1984 ***
70 '
80 '****************************
90 CLEAR 200:PCLEAR 8:DIM F(1400)
100 PMODE4,1:PCLS:PMODE4,5:PCLS:PMODE3,1
110 CLS:PRINT@160," DO YOU REQUIRE INSTRUCTIONS?
    PRESS 'I' IF
YOU DO IF NOT ANY  OTHER KEY WILL DO.
120 K$=INKEY$:IF K$="" THEN 120
130 IF K$<>"I" THEN 150
140 GOSUB 1400
150 K$="":CLS6:PRINT@10,"ARTIST";:PRINT @ 96," DO
    YOU  WISH  TO  DRAW  A  NEW        PICTURE  OR
    RECOVER AN OLD ONE   FROM TAPE?  (N/O)";
160 N$=INKEY$:IF N$="" THEN 160
170 IF N$="O" THEN 1100
180 IF N$="N" THEN 190 ELSE SOUND 100,2:GOTO150
190 '
200 PRINT@226,"JOYSTICK ? (Y/N)";
210 J$=INKEY$:IF J$="" THEN 210
220 IF J$="N" THEN J=0:GOTO270
230 IF J$<>"Y" THEN 200
250 PRINT@226,"USE RIGHT JOYSTICK ";
260 J=1:GOTO 275
270 PRINT@226,"USE ARROW KEYS .  ";
275 PRINT@290,"";:INPUT"PMODE (0 TO 4)   ";M
280 PRINT@322,"";:INPUT"START PAGE       ";P2
290 PRINT@354,"";:INPUT"      SCREEN  1,";S
300 IF N$="O" THEN L=1:GOTO 340
310   PRINT@386,"";:INPUT"BACKGROUND(0   TO   8
    FROM   COLOURS  AVAILABLE)     ";L
```

```
320 PMODEM,P2
330 PCLSL
340 PRINT@450,"";:INPUT"                  PEN";L1
350 PMODE M,P2:SCREEN 1,S
360 O=0:P=0
370 C=L
380 PSET(X,Y,L1)
390 K$=INKEY$:IF K$<>"C" THEN 520
400 SOUND 100,1:K$=INKEY$:IF K$<>"" THEN 410
    ELSE 400
410 COLOR L1,L:E=0:IF K$="I" THEN C=L1:GOTO 520
420 IF K$="O" THEN C=L:GOTO 520
430 IF K$="X" THEN 850
440 IF K$="R" THEN 1030
450 IF K$="E" THEN GOSUB 1240:GOTO 520
460 IF K$="H" THEN GOSUB 1400:SCREEN 1,S:GOTO 520
470 IF K$="G" THEN GOSUB1730:GOTO 400
480 IF K$="B" THEN 1290
490 IF K$="P" THEN 770
500 IF ASC(K$)<58 AND ASC(K$)>47
    THEN C=L:L1=ASC (K$)-48:C=L1
510 IF K$="C" THEN 400
520 '
530 O1=O:P1=P
540 IF E=1 THEN GOSUB 1240
550 PSET(O.P,L1)
560 IF J=1 THEN 620
570 IF PEEK(341)=223 THEN P=P-1
580 IF PEEK(342)=223 THEN P=P+1
590 IF PEEK(343)=223 THEN O=O-1
600 IF PEEK(344)=223 THEN O=O+1
610 GOTO 670
620 H=JOYSTK(0):V=JOYSTK(1)
630 IF H<8 THEN O=O-1
640 IF H>56 THEN O=O+1
650 IF V<8 THEN P=P-1
660 IF V>56 THEN P=P+1
670 IF P<0 THEN P=0
```

```
680 IF P>191 THEN P=192
690 IF O<0 THEN O=0
700 IF O>255 THEN O=256
710 PSET(O1,P1,C)
720 A=PEEK(65280)
730 IF A=63 OR A=191 THEN 740 ELSE 750
740 GOSUB 1160
750 IF C=L THEN 760
760 IF INKEY$="C" THEN 400 ELSE 530
770 SOUND 50,1
780 PSET(O,P,L)
790 K$=INKEY$
800 IF K$="" THEN 770
810 L2=ASC(K$):L2=L2-48
820 IF L2>8 OR L2<0 THEN L2=1
830 PAINT(O,P),L2,L1
840 K$="C" :GOTO 400
850 CLS4:PRINT "  YOU STOPPED! IF YOU WISH TO
    SAVE YOUR MASTER PIECE THEN      PRESS 'S'.
    ANY OTHER KEY WILL   RE-START."
860 Q$=INKEY$
870 IF Q$="" THEN 860
880 IF Q$="S" THEN 920
890 INPUT"DO YOU WANT A CLEAN SCREEN (Y/N) ";CS$
900 IF CS$="Y" THEN PCLS
910 N$="0":GOTO 200
920 CLS0:PRINT@129,"DO YOU WANT TO SAVE ON TAPE?";
930 K$=INKEY$:IF K$="" THEN 930
940 IF K$="Y" THEN 990
950 PRINT@193,"DO YOU WANT A PRINT ?";:
    PRINT@257,"";
960 K$=INKEY$:IF K$="" THEN 960
970  IF  K$<>"Y"  THEN  PRINT"i  do not
    understand";:FOR DL=1 TO 1000:
    NEXT DL:SOUND125,3::GOTO350
980 GOSUB 1770:GOTO 350
990 PRINT"SET TAPE TO CORRECT AREA.":MOTORON:
    LINE INPUT"WHAT  IS THE TITLE OF YOUR
    PICTURE?(UP TO 8 CHARACTERS)";T$
1000 IF P2<1 OR P2>8 THEN P2=1
1010          CLS4:PRINT"          RECORDING
    "T$:CSAVEM  T$,(P2*1536),13823,(P2*1536)
1020 PRINT"i've finished!":SOUND  180,5:FOR
    DL=1  TO  1000:NEXT DL:SCREEN1,S:GOTO 380
1030 SOUND 70,1
1040 K$=INKEY$
1050 IF K$="" THEN 1030
1060 R1=ASC(K$):R1=R1-48
1070 IF R1>100 OR R1<1 THEN R1=1
1080 CIRCLE(O,P),R1,L1
1090 K$="C":GOTO 400
1100 'SUB TO LOAD PICTURE FROM TAPE
1110  CLS3:PRINT  "SET TAPE TO CORRECT AREA ":
     MOTORON:LINE INPUT "NAME OF PICTURE
     SOUGHT?";T$
1120 CLS4:PRINT"LOADING PICTURE "T$
1130 PCLS:SCREEN1,0
1140 CLOADM T$
1150 GOTO 200
1160 'SUB TO DRAW LINES OF PERS-PECTIVE.
     ************************
1170 SOUND50,2
1180 IF W<>0 THEN W=1:GOTO 1220
1190 O3=O:P3=P:CIRCLE(O3,P3),4,L1
1200 W=1
1210 GOTO 1230
1220 LINE(O3,P3)-(O,P),PSET
1230 A=PEEK(65280):RETURN
1240 'ROUTINE  TO ERASE*************
1250 C=L
1260 LINE(O,P)-(O+5,P+5),PRESET,BF
1270 IF E=0 THEN E=1
1280 RETURN
1290 'ROUTINE TO DRAW BOXES
1300 IF B1=0 THEN 1390
1310 Q$=INKEY$:SOUND 230,1
1320 IF Q$="" THEN 1310
1330 IF Q$="B" THEN 1370
1340 IF Q$="G" THEN GOSUB 1680:B1=0:GOTO 520
1350 IF Q$="L" THEN 1360 ELSE 1310
1360 LINE(O,P)-(O4,P4),PSET:GOTO 1380
1370 LINE(O,P)-(O4,P4),PSET,B
1380 B1=0:O4=0:P4=0:GOTO 520
1390 O4=O:P4=P:B1=1:SOUND 75,2:GOTO520
1400 'SUB TO GIVE INSTRUCTIONS
     ****************************
1410 CLS0:PRINT@13,"artist";:PRINT@73,
     "*instructions*";:PRINT@12 8,"   THE  ARTIST
     PROGRAM CAN BE USEDWITH OR WITHOUT JOYSTICKS
     YOU CAN USE THE 'SHIFT' BUTTON  TO GIVE YOU
     LINES OF PERSPECTIVE  (MORE LATER.)"
1420 GOSUB 1550
1430 CLS2:PRINT" FIRST dragon WILL ASK YOU
     SOMEQUESTIONS TO SET  UP THE SCREEN. HAVING
     SET THE SCREEN YOU HAVE AFLASHING DOT.MOVE
     THIS WITH THE ARROW KEYS OR THE JOYSTICK.";
1440 PRINT@224," TO DRAW PRESS 'C' FOR CONTROL.
     dragon WILL BEEP WHILE HE AWAITSYOUR COMMAND."
1450  PRINT"********************************";:
      PRINT"   IF   YOU  NEED help AT ANY TIME
      PRESS 'C' THEN 'H'."
1460 GOSUB 1550
1470  CLS3:PRINT@32,"  COMMANDS CAN BE:-":
      PRINT@96," I - NOW THE DOT LEAVES A LINE
      IN YOUR PEN COLOUR.          O - REMOVES
     THE  PEN  FROM THE      PAPER.     X - STOPS
     THE DRAWING READY         FOR TAPING."
1480 PRINT"E - TURNS YOUR DOT INTO A LARGE ERASER."
1490 PRINT" 0-8 - CHANGES PEN COLOUR AFTER
     REMOVING  PEN FROM PAPER.
     (VALID COLOURS ONLY)"
1500 GOSUB 1550
1510 CLS 4:PRINT@32," B - TAKES YOU INTO BOX MODE.
     FIRST TIME ROUND dragon  REMEMBERS WHERE YOU
     ARE- NEXT TIME  ROUND   HE   WAITS (BEEPING)
     FOR EITHER.... 'B'...HE DRAWS A BOX  'L'...HE
     DRAWS A LINE.
1520 PRINT"'G'...HE GETS THE BOX."
1530  PRINT:PRINT"  G  - dragon WILL PUT BACK THE
      PART OF THE DRAWING YOU  HAVE ALREADY 'GOT'
      IN BOX  MODE."
1540 GOSUB 1550:CLS7:GOTO 1580
1550 PRINT@481," PRESS ANY KEY FOR NEXT PAGE  ";
1560 IF INKEY$="" THEN 1560 ELSE RETURN
1570 CLS7
1580 PRINT@ 64," P - dragon WILL  WAIT   (BEEPING),
     FOR  THE  NUMBER  OF  A  VALID  AVAILABLE
     COLOUR.  HE WILL       THEN PAINT UNTIL
     HE MEETS         THE PEN LINE COLOUR."
1590 GOSUB 1550
1600 CLS5:PRINT@64," R - dragon WILL WAIT
     (BEEPING)        FOR  A  RING  SIZE  FROM 1-Z.
     ( YES zed !!  )    HE WILL THEN DRAW A CIRCLE
      OF THAT SIZE."
1610 GOSUB 1550
1620 CLS8:PRINT@10,"*PERSPECTIVE*";:PRINT@96,"
     THE  FIRST  TIME YOU PRESS THE   'SHIFT'
     BUTTON dragon DRAWS A   SMALL TARGET AND
     EVEN IF YOU RUBIT OUT HE WILL REMEMBER
     WHERE ITWAS. ANY TIME YOU PRESS THE
      'SHIFT' BUTTON AGAIN HE WILL   DRAW A LINE
1630 PRINT"FROM WHERE YOU ARE  TO THE CENTRE
     OF THE TARGET."
1640 GOSUB 1550
1650 CLS7:PRINT@ 96," TO SAVE A PICTURE PRESS:-
     'C'   'X'   'S'  dragon  WILL  THEN SWITCH
    YOUR     RECORDER ON AND WAIT FOR A
    TITLE.HE WILL THEN SAVE IT IN   MACHINE CODE
   FOR YOU TO USE      IN ANY SUITABLY ADAPTED
   PROGRAM "
1660 PRINT@352," now get drawing!press  any  key"
     ::IF  INKEY$ ="" THEN 1660
```



```
1670 RETURN
1680 'SUB TO GET & PUT*********
1690 IF G<>0 THEN 1730
1700 GET(O,P)-(O4,P4),F,G
1710 O5=ABS(O4-O):P5=ABS(P4-P)
1720 G=1:GOTO 1760
1730 O6=O+O5:IF O6>256 THEN O6=256
1740 P6=P+P5:IF P6>191 THEN P6=191
1750 PUT(O,P)-(O6,P6),F,PSET:G=0
1760 RETURN
1761 '**************************************
1770 'SUB  TO  PRINT  PICTURE  TO  PRINTER
*******************************************
1780 'INSERT YOUR PRINTER ROUTINE  HERE
*******************************************
1790 RETURN
```

Battleships

***Mark Beckham** sets out to search and destroy.*

THIS PROGRAM provides a computer simulation of the game 'Battleships'. In this version, you are pitted against the computer and must destroy its ships before it sinks your fleet.

The computer draws up a hi-res grid and plots the positions of both its ships and your vessels. The computer then sets up a random search pattern for its shots while you can pick any spot on the grid and fire. A successful shot is greeted with a picture of the ship being blown up to the accompaniment of suitable sound effects.

Full instructions on playing the game are included in the program. Good luck.

Program notes

10-90	Get started and draw grid
100-360	Dimension arrays, see if instructions are needed and set positions of ships
360-480	Get player's shot, check for hit
490-660	Random hazards, computer's shot
670-790	Sound of missile and hit
790-1090	Graphics
1100-1430	Random hazards, plot grid, instructions ■

```
10 REM CLEAR GRAPHICS PAGES  NEEDED,CLEAR HI-RES SCREEN
20 PCLEAR8:PCLS
30 REM DRAW GRID
40 FOR YT=30 TO 190 STEP 16
50 LINE (40,YT)-(200,YT),PSET
60 NEXT YT
70 FOR VN=40 TO 200 STEP 16
80 LINE(VN,30)-(VN,190),PSET
90 NEXT VN
100 REM DIMENSION ARRAY FOR PRINTING & BLANKING OUT OF TORPEDO.CLEAR SCREEN
110 CLS
120 DIMTP(12,12)
130 DIM BL(12,12)
140 REM HELLO
150 REM GET STARTED:SEE IF USER NEEDS INSTRUCTIONS
160 PRINT@228,"**COMPUTER BATTLESHIPS**":FOR K=1 TO 1000:NEXT K
170 PRINT"NEED INSTRUCTIONS?"
180 NO$=INKEY$:IF NO$=""THEN180
190 IF NO$="Y" THEN GOSUB 1390
200 REM SET UP SHIPS
210 A=RND(100):B=RND(100):C=RND(100):D=RND(100)
220 REM CHECK FOR REPEATEDNUMBERS
230 IF A=B OR A=C OR A=D ORB=C OR B=D OR C=D THEN 210
240 CLS:PRINT"YOUR SHIPS  ARE AT:"
250 PRINTA:PRINTB:PRINTC:PRINTD
260 PRINT"HIT ANY KEY WHEN READY"
270 L$=INKEY$:IF L$="" THEN270
280 CLS
290 REM SET UP COMP SHIPS&CHECK FOR REPEAT OF NO
300 E=RND(100):F=RND(100):G=RND(100):H=RND(100)
310 IFE=F ORE=G OR E=H OR F=G OR F=H   OR G=H THEN300
320 PRINT"THE COMPUTER HAS SELECTED THE   POSITION OF IT'S SHIPS."
330 PRINT"HIT ANY KEY WHEN READY"
340 X$=INKEY$:IF X$="" THEN340
350 CLS
360 REM GET POSITION OF SHOT& CHECK FOR HIT
370 INPUT"COMMANDER,AT WHICH POSITION DO  YOU WISH TO FIRE SIR(1-100)";M:M=FIX(M
):IF M=101 THEN GOSUB1350
380 IF M>100 OR M<1 THEN CLS:GOTO370
390 REM BRANCH TO SOUND OF MISSILE SECTION
400 GOSUB690
410 REM BRANCH TO PAINTING OF GRID SECTION
420 GOSUB 1220
430 REM CHECK TO SEE IF A HIT HAS BEEN MADE.IF ONE HAS BEEN MADE THEN SET THE VA
RIABLE WHICH STORES THE SHIPS CO-ORDINATE TO ZERO SO THAT IT CAN NOT BE HIT TWIC
E,AND ADD ONE TO THE HIT COUNTER THEN BRANCHTO THE HIT SECTION.
440 IFM=E THEN E=0:ZA=ZA+1:GOSUB730
450 IFM=F THEN F=0:ZA=ZA+1:GOSUB730
460 IF M=G THENG=0:ZA=ZA+1:GOSUB730
470 IF M=H THENH=0:ZA=ZA+1:GOSUB730
480 REM COMPUTERS SHOT&CHECK FOR HIT
490 CLS:IFZA=4 THEN840
500 PQ=RND(100):IFPQ=10 THEN GOSUB1100:REM ONE OF THE RANDOM HAZARDS HAS OCCURED
510 IF ZB=4 THEN850
```

```
520 IF PQ=19 THENGOSUB 1160:REM A RANDOM HAZARD HAS OCCURED
530 IF ZB=4 THEN 850
540 REM GIVE THE COMPUTER HIS SHOT
550 O=RND(100)
560 PRINT"THE COMPUTER HAS SELECTED POINT ";O;"AS IT'S TARGET":FOR NN=1 TO 300:N
EXT NN
570 REM BRANCH TO SOUND OF MISSILE SECTION
580 GOSUB690
590 REM CHECK TO SEE IF COMPUTER HAS SCORED A HIT,IF IT HASTHEN SET VARIABLE STO
RING POSITION OF SHIP TO ZERO,ADD ONE TO SCORE COUNTER AND BRANCH TO HIT SECTION
600 IF O=A THENA=0:ZB=ZB+1:GOSUB730
610 IF O=B THENB=0:ZB=ZB+1:GOSUB730
620 IFO=C THENC=0:ZB=ZB+1:GOSUB730
630 IFO=D THEND=0:ZB=ZB+1:GOSUB730
640 REM IF THE PLAYER HAS LOST THEN TELL HIM SO.
650 IFZB=4 THEN850
660  REMBRANCH TO INPUT OF PLAYERS SHOT SECTION
670 CLS:GOTO370
680 REM SOUND OF MISSILE
690 FOR V=150 TO120 STEP -1
700 SOUNDV,1
710 NEXTV
720 RETURN
730 GOSUB890
740 REM SOUND OF HIT
750 PLAY"T100"
760 FOR Q=1 TO 30
770 PLAY"O4V31AG"
780 NEXTQ
790 CLS
800 REM A HIT HAS BEEN MADE.
810 PRINT@238,"a hit":FOR SM=1 TO 600:NEXT SM:FOR HA=1 TO4:PLAY"T50;O2CDEFGABO3C
DEFGABO4CDEFGAB":NEXT HA
820 RETURN
830 REM SOMEBODY HAS WON
840 PRINT"YOU BEAT THE COMPUTER!!":GOTO860
850 PRINT"PLAYER1,ALL YOUR SHIPS ARE LOST!HA,HA THE COMPUTER IS THE WINNER":GOTO
870
860 PLAY"O3T1GT4GA-A-P4T1L8GT2A-GFE-L2DP6L5A+G+L17GFG+FA+P8L4G+GFE-"
870 INPUT"ANOTHER GO";II$:IFII$<>"Y" THENPRINT"CHICKEN":END ELSE RUN
880 REM DRAW BOAT WHICH IS TO BE HIT BY MISSILE
890 PMODE4:SCREEN1,1:PCLS
900 DRAW"BM68,80;F8;R70;E3U5L80R10U1L5U3R15D3L5D1L9U3L6R6D2R9U1L9U1R9U1L9R12D4BM
96,80;U14D4L2R2U4R6U10R6L2U4L2R2D4R2D10R6D4L20"
910 DRAW"BR20U4R8D4L8R8D2R6D6R18D1U1L8U16L4G2DR6L6D13"
920 DRAW"BM122,76;R2D4L2U4;BM98,78;U6R2D6L2;BM68,80F3R78"
930 REM FILL PARTS OF BOAT WITH COLOUR
940 PAINT(110,76),1,1
950 PAINT(134,72),1,1
960 DRAW"BM10,183:L3G7F2E7U2D2G7H3"
970 REM STORE TORPEDO AND BLANK AREA IN ARRAY
980 GET(1,1)-(13,13),BL,G
990 GET(1,180)-(13,192),TP,G
1000 REM MOVING HI-RES GRAPHICS
1010 FOR A=1 TO92 STEP 3
1020 REM PUT TORPEDO ON SCREEN THEN BLANK IT OUT.REPEAT THIS TO CREATE MOVEMENT.
1030 PUT(A,181-A)-(A+12,193-A),TP,PSET
1040 PUT(A,181-A)-(A+12,193-A),BL,PSET
1050 NEXT A
1060 PUT(92,89)-(104,101),TP,PSET
1070 REM DRAW CIRCLES OF INCREASIN RADII AND RANDOM COLOUR TO CREATE AN "EXPLOSI
ON"
1080  FOR O=1 TO10: ZC=RND(2)-1:CIRCLE(105,83),O,ZC:FOR YU=1 TO 10:NEXT YU:NEXT
O
1090 RETURN
1100 REM ONE OF SHIPS LOST
1110 PRINT"ONE OF YOUR SHIPS HAS BEEN LOST IN THE FOG":ZB=ZB+1
1120 FORCM=1 TO 2000:NEXT CM:CLS
1130 REM SHIP MAY BE FOUND DEPENDING ON RANDOM NUMBERS
1140 CX=RND(5):DE=RND(6):IF DE=3 AND CX=2 THEN 1150 ELSE RETURN.
```



FOR DRAGON AND TANDY USERS

SATURDAY 30TH AND SUNDAY 31ST MARCH
THE ROYAL HORTICULTURAL HALLS
10 A.M. UNTIL 6 P.M.

Everyone said the first show was good!
"Over 7,000 people attended ... queues formed early ... "Dragon User, Jan 85.
"The show was a tremendous success" Dragon Users Group.
"Many thanks for the very worthwhile 6809 show" Grosvenor Software.

This show will be even better!!
Even more to see and choose from. The very latest **hardware, software, interfaces** and **peripherals** will be there together with all your old favourites. Your chance to get up to date, try and buy all thats new. And pick up some **amazing bargains**.

Over 60 companies and organisations will be exhibiting with **special offers** on their products.

We'll also be organising events and competitions with **lots of prizes**. The manufacturers will be staffing **advice centres** to help with all your queries.

Large gangways and spacious rest areas will make sure you can see everything and sit in comfort when you want. The second 6809 Colour Show is a **family** show, a good day out.

HOW TO GET THERE

The Royal Horticultural Halls are just off Victoria Street a few minutes walk from Victoria or Parliament Square.

Buses 11, 24, 29, 70, 76 and 88 run up Victoria Street.

Underground stations; St. James Park (District and Circle lines), Victoria (District, Circle and Victoria lines).

There is an NCP car park in Abingdon Street, a few minutes away.

This exhibition is organised by:
Computer Marketplace (Exhibitions) Ltd.,
Part of the Rushworth Dales Group,
20 Orange Street,
LONDON WC2H 7ED

To: Computer Marketplace (Exhibitions) Ltd., 20 Orange Street, London WC2H 7ED

Please rush me 'fast lane' tickets for the Second 6809 Colour Show.
☐ (Qty) Adult tickets at £2.00 ☐ (Qty) Under 12 year old tickets at £1.00

I enclose cheque/P.O. to the value of £________ or debit my Access/Diner/American Express card
No.________________ Signature________________
Name________________
Address________________
Postcode________________ Telephone________________

6809 is the registered name of Motorola Ltd.

```
1150 PRINT"YOU WERE LUCKY,IT HAS BEEN FOUND":ZB=ZB-1:FOR CB=1 TO 2000:NEXT CB:CL
S:RETURN
1160 REM ANOTHER HAZARD
1170 PRINT"THE CREW OF ONE OF YOUR SHIPS LOST THEIR NERVE"
1180 PRINT"THEY ABANDONED SHIP":ZB=ZB+1
1190 FOR HS=1 TO 2000:NEXT HS
1200 CLS
1210 RETURN
1220 REM SET GRAPHICS MODE AND COLOUR SET
1230 PMODE3,5:SCREEN1,0
1240 REM SECTION TO PAINT HI-RES GRID
1250 A5=0
1260 A6=0:A7=0
1270 FOR A6=38 TO 182 STEP 16
1280 FOR A7=48 TO 192 STEP 16
1290 A5=A5+1
1300 IF A5=M THEN PAINT(A7,A6),2,4:GOTO 1320
1310 NEXTA7,A6
1320 FOR EW=1 TO 1000:NEXT EW
1330 RETURN
1340 REM USER HAS REQUESTED TO SEE HI-RES GRID-SHOW HIM IT.
1350 PMODE3,5:SCREEN1,0
1360 IF INKEY$="" THEN 1360
1370 RETURN
1380 REM INSTRUCTIONS
1390 CLS:PRINT"IN THIS GAME YOU,OUR BRAVE SEA  CAPTAIN MUST DEFEAT YOUR ENEMY.(
THE FIERY DRAGON(32K VARIETY)) THIS WILL NOT BE EASY.UNKNOWN   HAZARDS AWAIT YOU
.TO SHOOT YOU  PICK A NUMBER(1-100).THIS POINT YOU WILL SEE ON A HIGH-RES GRID"
1400 FOR NC=1 TO 7000:NEXT NC
1410 CLS:PRINT"YOU CAN SEE THE THE GRID BY       TYPING 101 IN REPLY TO THE
'COMMANDER,WHERE DO YOU WISH TO  FIRE SIR'.PROMPT.HITTING ANY    KEY WILL RETURN
 YOU TO TEXT.     GOOD LUCK.BYEE"
1420 FOR NB=1 TO 6000:NEXT NB
1430 RETURN
```

Dragon bulletins

WITH THE demise of Dragon Data, many Dragon computer owners feel very let down with many software companies abandoning the Dragon for more lucrative markets.

However, now you have a chance once again to put your humble Dragon to work and open up new horizons. On February 17 a new bulletin board went on-line. This bulletin board is operating in conjunction with REACT United Kingdom's (a volunteer communications organisation) bulletin board. As well as providing information about REACT UK and what local teams are doing in the community, there is also a section for Dragon computer owners.

If you are the owner of a Dragon 64, all that you will require is a telephone modem with a 300/300 baud operating rate, and some software to drive it. Owners of the Dragon 32 will also require an RS 232 interface. However, this need not cost you a fortune.

I have been trying out the communications packages supplied by Cotswold Computers of 6 Middle Row, Chipping Norton, Oxon, who can supply a complete communication package for the Dragon 32 for £169. Disk drive users can still use their drives as the RS 232 interface and DOS cartridge will work in tandem if you use a mother board. Dragon 64 owners having an RS 232 interface built into their machines only require a modem and software which will cost about £115.

If this sounds like a lot of money to spend to access one Dragon bulletin board, bear in mind that once you have purchased your comms unit you will be able to enter the fascinating world of Micro Communications. If you have never experienced the joy of your home computer talking to, and being answered by, giant mainframes I can assure you that it opens up a new world of exciting possibilities.

RBBS, the new bulletin board, caters for Dragon computer owners who have sadly been neglected by most of the other bulletin boards. There will be facilities to leave messages for other Dragon users, to swap ideas and problems on the Noticeboard section, and even sell your unwanted bits and pieces. If the demand is there, it will also have facilities to upload and download free software. But, the most important thing about RBBS is it is for Dragon users to communicate with other Dragon users to help and further the use and understanding of the Dragon computer — and its FREE.

RBBS will be on line 24 hours a day, except for Saturday mornings between 9 am and 12 noon when the system will be updated. The system runs on a Dragon 64 with specially written software and several disk drives.

To access RBBS first connect your modem and run the software — make sure the modem is set for 300/300 baud. Dial up RBBS on 0376 518818. After one or two rings the auto answer modem will transmit a tone; then switch your modem on-line and and replace the telephone receive. You should then receive the opening page which will tell you that you are connected to RBBS.

You will be asked to enter your name and password. Please enter your correct name as this will be used at a later date to let you know if there are any messages for you. As you will be a first time user, enter U to the prompt PASSWORD. You will then be asked if your computer will accept lower case letters; answer Y if yes, if not answer N. You will then be presented with a menu of options that you may access. You will not be able to use the Noticeboard until you register as a user — this is to prevent abuse of this section. Registration is FREE and facilities are available on the bulletin board for you to register.

We want you to have fun using the bulletin board, but please remember that any bulletin board is only as good as the people who use it, so your contributions and comments are very important. ■

Brian Lloyd

Forth Protocol

***Mark Varney** explains how Forth is used as a language*

FORTH IS probably one of those least understood but most versatile and useful programming languages available today. Versions of FORTH seem to be available for almost every type of machine today — even including the new 32-bit processors. While end-users of the language (including both programmers and hardware design engineers alike) seem to endlessly extol its virtues, FORTH does not seem to have developed the following or popularity it deserves. This is unfortunate, especially to people like myself who seem to have been mistakenly labelled with the title of "software gurus" because we dabble in a language which is neither primitive (machine code) nor high-level (eg Basic), and use computer jargon that is not in common use.

FORTH is, admittedly, not an easy language to understand at first glance. The immediate impression a newcomer to FORTH would get is that the language consists only of "words" — there are no line numbers — and that numbers have to be entered in before the operators. A program would, therefore, consist of several words all on one line, or on several, separated by blanks and contained either in a "dictionary" or within "screen-files" (both convenient areas of RAM which can be saved in the same way as a Basic program listing). The difference between them is that the dictionary will hold words which can be used immediately by typing them in at the keyboard. Screen-files, on the other hand, contain words which have to be loaded into the dictionary before they can be used.

An extremely useful feature of FORTH is that "words", which carry out different routines designed by the programmer, can be called anything you wish. This flexibility can be a valuable asset in aiding the "documentation" of a program — for example, the following sequence of four FORTH words:

GET-DATA-VALUE
TAKE-SQUARE
MULTIPLY-BY-PI
PRINT-VALUE

needs no explanation as to what happens to the DATA-VALUE. The use of English (in this case) means that programs can employ an application-specific vocabulary of words that will clearly be understood by the user.

Another useful feature is that this sequence of words can all be defined within yet another FORTH word so that only one word, eg AREA, need be typed in, instead of all four, in order to "execute" the routine. The sequence of defining words within words can go on *ad infinitum*, and it is this procedure that gives writing programs in FORTH the name "bottom-up" or "structured programming".

The process of building up routines and defining words in this way, and then entering them into the dictionary is known as "compilation". All high level languages have a dictionary of sorts — you'll find one if you PEEK around the Basic ROM (from &HA049 onwards) inside the Dragon, for example.

FORTH's dictionary begins in low memory, and expands up sequentially towards high memory, so, for example, AREA would be the last entry if no other words were defined afterwards. When it comes to "executing" the word AREA, FORTH will load an "instruction pointer" with the address of the last word in the dictionary and, if it corresponds to the word typed in, will start to run that routine. If the two words do not correspond then the last word in the dictionary will itself contain another pointer to the previous word before it in the dictionary (actually called a "link address"). If this does not fit then the next word is "linked" and tested, and so on until (in the case of a typing mistake) the whole dictionary would be searched from top to bottom.

Elementary routine

If the word definition is a very elementary routine — like adding two numbers together, or the LOOP instruction (similar to Basic's FOR...NEXT) — then the procedure used to carry it out is written immediately after the dictionary entry, and in machine code. The elementary words are termed "primitives", since you cannot do much else without them. Because the "primitives" are so useful they cannot usually be erased from the dictionary as can other words.

It is for these reasons that some people

High memory --›

Word, eg. VALUE	Addr of previous word in dictionary (LFA)	Addr for code (CFA)	Parameter field (PFA)	Word, eg. AREA	Link address (LFA) i.e.	Code field address	Parameter field
32 bytes	2 bytes	2 bytes	as many bytes as necessary				

Figure 1.
Schematic diagram of a FORTH word as seen in the dictionary. The words are divided into four 'fields' holding either code or an address pointer. The code field address contains a pointer to executable machine code or to the parameter field. The address pointer for the vocabulary is held within the parameter field.

use FORTH alone — because of the linking nature between words the language is fast (much faster than Basic) and for certain cases can be as fast as machine code if properly "tuned". That, indeed, should be sufficient incentive for anyone to learn FORTH who requires speed but does not wish to learn machine code/assembler!

Words which access other pre-defined words or do not act on numbers alone will have a similar structure, but will branch off to other addresses in the dictionary and jump back again, using these routines exactly as subroutines. Actually, when it comes to examine FORTH words in more detail (which is not usually necessary), they contain more address codes which link the word to various other parts of memory (figure 1). But it is this structure that "forces" FORTH to have a very low memory requirement, comparable to, and in many instances less than the equivalent assembler routines! For example, if a particular application were being developed (word processor, editor, debugger, etc) then the final program might be compressed into an area as little as 2Kbytes!

This makes FORTH an ideal language to have on small microcomputers where memory size is naturally at a premium. Where one might consider, eg, the writing of a routine for an EPROM blower or communications network too complex, it is actually an easy matter in FORTH (once you know what to do). Even complex subjects such as artificial intelligence programming, or digital signal processing, are easily implemented on the FORTH system.

FORTH is used extensively in my work in electrochemistry for the generation of signals applied to electrodes and the collection of data. Under most circumstances, FORTH is fast enough to deliver and capture signals at rates up to several hundreds, and even thousands, of Hertz. On the odd occasion when higher data sampling rates have been required, FORTH, again, has the facility to enable machine code to be used in place of FORTH words.

Assembler written in

So, instead of having to load up a separate assembler/editor to "code" a particular routine, and then have to deal with complicated USR calls from within Basic, an assembler is written into the FORTH dictionary and the resultant machine code is used just as another word would be. This is a perfectly natural process because FORTH is, itself, a series of machine coded routines that are "threaded" together through the use of link and calling addresses. My own philosophy has been to write everything in FORTH, and then, if a particular portion of a program needs speeding up (eg the graphics), then those rate-limiting steps would be re-coded in machine code. This is, in fact, probably the easiest way to learn machine code/assembly language because FORTH is so close to it itself.

However, the major disadvantage is that FORTH relies heavily on the programmer to detect and correct mistakes. FORTH does not have all the extensive error checking facilities of Basic, so it does not automatically monitor (for instance) the "zero" condition when one number is divided by another, or the "over-range" condition on multiplication.

Indeed, the representation of numbers in general terms is poor; the 6809 Dragon versions of FORTH do not come with floating-point arithmetic. Mathematical routines have to be done in integer arithmetic — the variety of words for handling integers is actually much better than Basic. However, it is not difficult to write your own fixed- or floating-point software routines (figure 2), and this is where I think much of the misunderstanding comes in.

FORTH has never had a "standard" in the same way as Basic has, and it probably never will because different people use it for different applications. Not everyone wants an extended arithmetic capability, and, for them, it would only take up valuable memory that could be used for other purposes. The flexibility of FORTH has meant that there are no programming barriers — the ultimate performance is only limited by the ingenuity of the programmer. Sine, cosine, logarithms, etc, are quite easy to code yourself (figure 3) once you have been shown how to do it.

The concept of the "stack" and handling of numbers is perhaps the hardest feature

Figure 2
FORTH definitions for some elementary fixed arithmetic expressions

```
SCR £ 1
Ø VARIABLE A1  Ø VARIABLE A2                                   <
Ø VARIABLE B1  Ø VARIABLE B2                                   <
: D* A1 ! A2 ! B1 ! B2 !          ( DOUBLE PRECISION MULTIPLY )  <
B2 @ A2 @ U*   B2 @ A1 @ U* DROP +                             <
B1 @ A2 @ U* DROP + ;                                          <
: FIX DPL @ Ø< IF S->D Ø DPL !  ( FIXED-POINT FUNDAMENTAL OP )  <
 THEN DPL @ 4 SWAP DO 1Ø. D* LOOP ;                            <
: F+ D+ ;                         ( FIXED-POINT ADDITION )      <
: F- -1 D+- D+ ;                  ( FIXED-POINT SUBTRACTION )   <
: F* D* DUP >R DABS 1ØØØØ M/MOD ( FIXED-POINT MULTIPLICATION ) <
      R> Ø< IF DMINUS THEN ROT DROP ;                          <
: F. SWAP OVER DABS <£ £ £ £ £  ( FIXED-POINT PRINT )          <
46 HOLD £S SIGN £> TYPE ;                                      <
                                                               <
;S                                                             <
```

The numbers first have to be converted into fixed point numbers by the FIX command which counts the number of digits to the right of the decimal place and traps out integers. If this were not done, the numbers would only be entered as double precision values.

Examples of use:

```
 Ø.Ø1   FIX  5      FIX F+ F.   5.Ø1ØØ OK
1Ø      FIX  Ø.Ø2   FIX F* F.   Ø.2ØØØ OK
-4.Ø2   FIX -2.111  FIX F* F.   8.4862 OK
 3.1415 FIX  2.25   FIX F- F.   Ø.8915 OK
```

▶

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◄ Figure 3.

Sine and cosine definitions with result scaled by 10000.

```
SCR £ 2
 : TABLE <BUILDS 0 DO , LOOP DOES>                                  <
         SWAP 2 * + @ ;              ( STACK TO DICTIONARY ENTRY )  <
10000 9998 9994 9986 9976 9962 9945 9925 9903 9877                  <
 9848 9816 9781 9744 9703 9659 9613 9563 9511 9455                  <
 9397 9336 9272 9205 9135 9063 8988 8910 8829 8746                  <
 8660 8572 8480 8387 8290 8192 8090 7986 7880 7771                  <
 7660 7547 7431 7314 7193 7071 6947 6820 6691 6561                  <
 6428 6293 6157 6018 5878 5736 5592 5446 5299 5150                  <
 5000 4848 4695 4540 4384 4226 4067 3907 3746 3548                  <
 3420 3256 3090 2924 2756 2588 2419 2250 2079 1908                  <
 1736 1564 1391 1219 1045 0872 0698 0523 0349 0175                  <
 0000                                ( 91 VALUES PLACED ON STACK )  <
91 TABLE SINTABLE                   ( AND THEN PUT IN DICTIONARY )  <
: S180 DUP 90 >                     ( TESTS IF GREATER THAN 90 DEG )<
IF 180 SWAP - ENDIF                 ( YES? SUBTRACT 180 DEGREES )   <
SINTABLE ;                          ( AND THEN TAKE SINE )    -->   <

SCR £ 3
 : SINE 360 MOD                                                     <
DUP 0< IF 360 + ENDIF               ( BRING RANGE WITHIN +/- 360 )  <
DUP 180 >                           ( ?GREATER THAN 180 DEGREES )   <
IF 180 - S180 MINUS                 ( YES? SUBTRACT 180, NEGATE SIN)<
ELSE S180 ENDIF ;                   ( NO? TAKE STRAIGHT SINE ANGLE )<
                                                                    <
 : COS 360 MOD                      ( PREVENT OVERFLO NEAR 32767 )  <
90 + SINE ;                         ( COS=SINE + 90 DEG PHASE SHIFT)<
;S                                                                  <
                                                                    <
                                                                    <
                                                                    <
                                                                    <
                                                                    <
                                                                    <
                                                                    <
```

Examples of use;

```
 90 SINE .    10000 OK
 45 SINE .    7071 OK
265 SINE .    -9962 OK
290 COS  .    3420 OK
```

of FORTH to understand. There are two stacks: a parameter stack and a return stack — the return stack is not encountered often except for very specialised operations. Anyone who has had either a Sinclair or Hewlett-Packard calculator will be familiar with stacks and "reverse Polish logic", as it's called!

Temporary store

Any stack is simply a contiguous area of memory where data may be temporarily stored. Each stack location may hold a single value, and the position of the last value added to the stack is held in a "stack pointer" (as an address). Putting data on to the stack is much like piling cafeteria trays up — the last entered value is the most "visible", those below cannot be accessed until the top value is removed, but you can see how big the pile is. So, to add two numbers together, for example, both numbers should be entered on to the stack, then the mathematical operation for addition performed (the stack pointer is automatically adjusted at each step).

Getting used to the stack and manipulating numbers once they are on it is a matter of experience, but again, stack operations at first sight can seem a little peculiar. For example, the equivalent of FOR...NEXT in FORTH is DO...LOOP but where Basic would specify the beginning and end limits of the counter as I = 1 TO N, the two limits have to be placed on the stack first and in reverse order so that the "1" comes off first, ie N 1 DO...LOOP. But the stack operations are a very powerful feature of FORTH: it is possible to SWAP the top two numbers on the stack, ROTate them, copy one value OVER another, DUPlicate or DROP the top value, and so on. An example of using the stack to advantage is instead of writing a separate subroutine that uses specific locations in memory to hold initial, intermediate and final calculations, a 16 by 16 or even 32 by 32 bit multiplication can be carried out on the stack — this will almost certainly run faster than the equivalent machine code version.

No language is perfect for all programming tasks. For example, Basic is an easy language to learn and acceptably good at string handling, but it is extremely slow and is limited in extended arithmetic operations. Attempting to write a fast 32-bit integration routine or an interactive database management system would push the language far beyond its intended scope.

Greatest strength

As a language, FORTH is not exactly the "bees knees", otherwise it would be far more popular than it already is — but it promotes the development of efficient, logical, straightforward and compact programs (even by inexperienced programmers). FORTH programs are usually portable across different machines even having completely different operating systems. The greatest strength lies in the building-block approach to programming, permitting segments of code to be immediately tested and debugged on their own. FORTH contains both "system" and "program" development aids, including a compiler, screen or text editor, input/output drivers and memory management — all of which are directly under the control of the user. ■


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Dragonsoft

New software for review should be sent to *Dragon User*. 12-13 Little Newport Street, London WC2H 7PP.

Masterstroke 2

Program: *Masterstroke 2*, PiKaDee Software, 35 Parker Street, Preston, Lancs. **Price:** £6.95

THE NUMBER of utility packages appearing for the Dragon emphasise just how much of a programmers' machine it is. All the potential it has to accept new modifications to the original software. I only wonder why Dragon Data did not incorporate many of these ideas into their original BASIC Interpreter.

Masterstroke 2 is a useful addition to any Basic programmer's supply of commands. A number of the rather obvious omissions from the Dragon Interpreter such as a MERGE command to merge BASIC program files; Autorepeat of keys; Inversion of the screen display (green on black or orange on black are available); and full error messages are included along with a host of other useful commands.

Also made available from BASIC are the Semigraphics mode described in Keith and Steven Brain's book *Advanced Sound and Graphics for the Dragon*. In this case they are called by GMODE. A number of special graphics commands are supported GLINE, GDRAW and GSET are rather similar to the ordinary PMODE commands with similar names. It is also possible to have text mixed with the graphics.

Special commands are available for scrolling the screen contents in all four directions. Scrolling can be restricted to a part of the screen as well. In addition, we also have a facility whereby the 10 number keys can be programmed as function keys when used with the right arrow pressed. These keys have already been given default values but it is also possible to redefine any of them for your own particular needs.

Program listing speed can also be changed, which normally needs a POKE to set unless you have *Masterstroke* installed. Another useful utility is a command to convert a Tandy Co Co Basic program into Dragon Basic. Various other commands give more options on the appearance of the display as well as the ability to strip off all the REMs in a program automatically.

Just in case the advantages of the Semigraphics modes are not apparent to the user, they have supplied a program written to demonstrate this facility in use. This is another version of that old favourite of ancient Apple users, the little Brick Out game, and it serves its purpose well.

All in all we have here a very useful utility package, produced at a very reasonable price of £6.95, with a well-written set of instructions. Once you have mastered the usual Basic fairly well then you could well find this to be a worthwhile purchase. With the facilities it offers at the price it cannot but be very good value.

Iolo ap Gwynn



Money, money, money!

Program: *Moneybox*, Harris Micro Software, 49 Alexandra Road, Hounslow, Middlesex TW3 4HP.
Price: £14.99 (Disk)

ON RUNNING this program the display is converted into a 42 by 24 character on the graphics screen by a Machine Code routine, which is held on the disk and called upon running the main program. The display created is very good, and even includes the £ sign.

Also incorporated is an auto-repeat for the keyboard. If anything, this is the most annoying part of the program because they have made the delay before a repeat is registered much too short. I have not been able to time the delay, but it seems to be less than a second.

With Moneybox it is possible to set each of the files (up to 99 separate ones) for a totally different purpose and account structure. Each file is divided into 12 periods, and the day upon which each period starts can be defined by the user. Within each file there can be up to 80 accounts. Fifty of these are already defined, but can be changed very easily, whilst 30 are left blank for any extra headings which may be required. The first 20 are identified as Sources of funds The next 20 are sources of income.

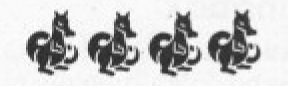
Finally, account numbers 41 to 80 are for expenditure.

Moneybox can then manipulate the data on these files to keep your bookkeeping up to date, including VAT calculations if required. All receipts, payments, etc, are easily recorded and from these you can print out reports on to the screen or a printer, prepare budgets and make forecasts of just how much of an overdraft you will have in a year's time!

It is designed to be used also by a small business as a simple cashbook accounting system. A comprehensive book of instructions comes with the disk, and needs to be read carefully before attempting to use the program. If anything, the only criticism I have of the program itself is that it takes quite an effort to learn how to use it.

Personally, I prefer the spreadsheet approach to this type of task. In that it is easier to follow, especially in asking "what-if" types of questions etc. Having said that, this still is quite a good package and would be very useful for anyone wishing to do such work.

Iolo ap Gwynn



Downland

Program: *Downland*, Microdeal, 41 Truro Road, St Austell, Cornwall. **Price:** £7.95

AS WE have come to expect from Microdeal here is another quality arcade type game written in machine code The general idea this time is that the little character which appears on the screen has to be controlled by means of a joystick and its button through a series of caverns.

On the way, he has to jump to grab various items or "Treasures" as well as collect a key to pass through doors. In places he also has to climb ropes in order to negotiate some of the more difficult parts of the caverns. Controlling the jumping from the ropes is not easy even without the various horrible cavern-living creatures such as poisonous ants and birds which seem to appear at random and frequent intervals.

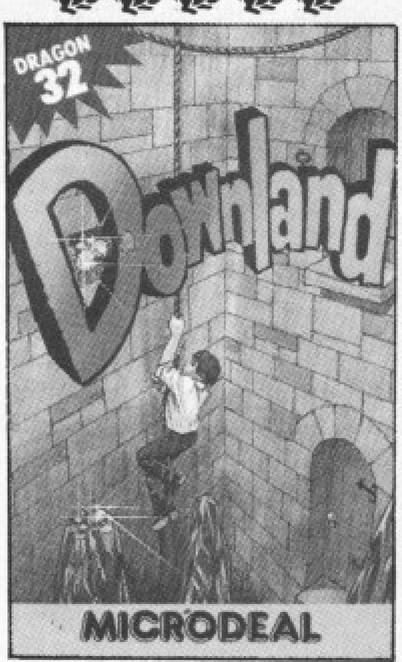
At first, it is not that obvious how to control the little man. Specific points have to be reached on the ropes before jumping for a ledge. The jump itself must be made with the joystick in the correct position. All of this has to be learnt as you are playing the game. At first your three "lives" do not seem to last very long, but as you learn how to play the game and learn the necessary skills and you think you are getting on top, it brings out a few new surprises, just to make life interesting.

The sounds are quite good and the highest resolution graphics are used, which means that you have a choice between black, green or buff backgrounds. Having said that, the quality of the graphics are good and the little walking, jumping and climbing man is quite realistic. I particularly liked the bit where he is trying to climb through a closed door!

If you are into challenging games like this then this is a must!

Iolo ap Gwynn





The Dragon Roars

***Pam D'Arcy** shows how to make your Dragon talk back to you*

A PROBLEM with using sound in BASIC on the Dragon is that it can be too pure and slow for many modern day sounds to be produced. What amazes me is that producing sound in machine code is unbelievably easy. As with graphics, the difficulty lies within ourselves — either you are good in ideas and design, or, like me, you struggle!

Rather than getting bogged down in a lot of detail first, as it is quite a short exercise, try the sample 'SOUNDBOX' and I am sure that you will want to read on and begin constructing your own particular 'box of sounds' to use in conjunction with your BASIC or machine code graphics programs.

Soundbox

Listing 1 — SOUNDBOX HEX DUMP. Following complimentary remarks from users of the HEX LOAD method accompanying my Disassembler article, I have retained that formula.

Listing 2 — HEX LOADER (Basic). This is the Disassembler Hex Loader Program with changes to just three lines (numbers 3,42,47 for those who have retained their copies). For readers who did not see or use it, please turn to Figure A for instructions.

Listing 3 — SOUND SELECTOR (Basic). A self explanatory sound menu program allowing you to call up and repeat sounds at the touch of a key (you couldn't type EXEC in fast enough for proper appreciation of some of the SOUNDBOX effects).

Using HEX LOADER, enter the 'SOUNDBOX' machine code (Listing 1). Save the code (CSAVEM "SOUNDBOX", 28001,28300,28001). Enter and save the 'SOUND SELECTOR' program. RUN the SOUND SELECTOR.

The machine code program that you have been using is position independent so will work if placed elsewhere in memory. It is structured so that, using an Assembler, simple amendment to the 'SOUND ROUTINE TABLE' will enable you to add or delete specific sound routines, building up a composite library of sounds that can be instantly called from BASIC programs by a simple POKE and EXEC. With machine code being so economical in memory, why not put all your sounds into one box, so to speak? Individual sound routines may be changed at any time and the re-assembly will automatically generate the correct current SOUND ROUTINE TABLE values for you.

The CONTROL ROUTINE switches on the sound source, executes the required sound routine according to the parameter passed across (POKEd) by BASIC, switches off the sound source and returns to the BASIC program. I used DREAM with PCLEAR1:CLEAR200,10000. Source code (object code $6D61-$6D83):

If you commence machine code routines with a Long BRAnch to the program entry point proper, as with this routine, the area immediately following the LBRA instruction may be used for passing information between BASIC and machine code (who says not to use EXEC because you can't pass parameters? I find this method far easier than USR). With this technique, no matter how many changes you subsequently make to the machine code routine, you are unlikely to need to go back to the BASIC programs to amend the EXEC or POKE addresses. The method used to branch to the specific sound routines has many advantages:

a) it generates position independent code (PIC) enabling SOUNDBOX to work regardless of eventual load position.

b) there is no upper or lower limit on the number of SOUND ROUTINES supported by the program.

c) maintenance is easy as should amendments cause actual start addresses of the individual routines to change, an Assembly automatically generates an up-to-date table of values.

Use of the PIA has probably been the most consistently contentious issue in *Dragon User*. Should anyone dispute what I have to say about it or sound, or my explanations, my only defence is that I am neither a scientist nor musician and this is how I understand things to work in my layman's terms — and work they do.

There are two means of producing sound from within the Dragon other than through the external sources of cassette and cartridge ports. One way is known as the 'single bit sound signal' (that I have not yet found exciting) and the other, discussed here, is the very flexible and easy to use DAC (Digital to Analogue Converter).

Sound is produced by switching on the equipment that controls the DAC, the MULTIPLEXER CONTROL LINES, and outputting a series of values 0-63 to the DAC itself. The actual sound made then depends on:

VOLUME or AMPLITUDE or LOUDNESS or STRENGTH	*of the sound made*
PITCH or FREQUENCY or DURATION or RATE OF CHANGE	*of the sound made*

```
***********************************
** SOUNDBOX (C) P.D'ARCY 1984 **
***********************************

        LBRA   START

* sound sel. param. from BASIC *
BPARAM FCB     0

* equates
EDAC    EQU    $FF20 ;addr of DAC
EENAB   EQU    $FF23 ; " SND ENAB.
EENON   EQU    $08   ;sound on
EENOF   EQU    $F7   ; "     off
ESSEL   EQU    $BD41 ;sound select
ESDAC   EQU    $00   ;select DAC
EROAR   EQU    $8000 ;start 'ROAR'
EROARE  EQU    $C000 ;end of'ROAR'

***********************************
******* CONTROL ROUTINE ********
***********************************
START   PSHS   D,X,Y,U
        BSR    SNDON
        LEAX   SNDTAB,PCR
        LDA    BPARAM,PCR
        ASLA
        LDD    A,X
        JSR    D,X
        BSR    SNDOFF
        PULS   D,X,Y,U,PC

****** SOUND ROUTINE TABLE *****
*                           BPARAM
SNDTAB FDB    LASER-SNDTAB   ;0
       FDB    PHASER-SNDTAB  ;1
       FDB    ROAR-SNDTAB    ;2
       FDB    EXPLOD-SNDTAB  ;3
       FDB    GUN-SNDTAB     ;4
       FDB    FREQ-SNDTAB    ;5
```

I am told that the ear contains a number of receptor cells, each one of which responds to a specific frequency. It is able to recognise a number of different frequencies of sound simultaneously. All sound is made up of amplitude and frequencies. Most noises are not a single sound but a simultaneous mix of sounds at different frequencies.

The Dragon is able to output sounds at frequencies far higher than the human ear can detect, so often output needs to be slowed down to make it audible to humans. If you can analyse the sound that is needed, then it can probably be recreated on the Dragon. Analysis of sound for translation to computer terms should make a very interesting article — any takers? My efforts are produced by trial and error.

The greater the difference between any two consecutive values output to the DAC, the louder the noise is to the ear. The maximum difference is 63 (range=0 to 63)

The longer the duration, or delay, between changing the values output to the DAC, the lower in PITCH the noise sounds. There are no limits to the intervals between outputting consecutive values to the DAC, but there are limits to what the ear can detect.

```
Listing 1
SOUNDBOX HEX DUMP

28001 16 00 01 00 34 76 8D 1B 30 8C  549
28011 0C A6 8C F5 48 EC 86 AD 8B 8D 1458
28021 1F 35 F6 00 53 00 63 00 7E 00  638
28031 8D 00 AA 00 D2 34 46 C6 00 BD 1030
28041 BD 41 F6 FF 23 CA 08 F7 FF 23 1537
28051 35 C6 34 02 B6 FF 23 84 F7 B7 1339
28061 FF 23 35 82 34 02 48 48 34 02  725
28071 B6 FF 20 84 03 AA E4 B7 FF 20 1472
28081 32 61 35 82 34 04 5A 26 FD 35  820
28091 84 8D E3 8D F5 39 00 34 02 A4 1161
28101 8C FA 8D F3 35 82 C6 01 86 3F 1353
28111 8D EB 4F 8D E8 5C C1 C8 26 F4 1595
28121 39 00 10 8E 00 05 86 3F A7 8C  724
28131 F6 8D BB 4A 26 FB 6A 8C EE A6 1587
28141 8C EB 26 F3 31 3F 26 EA 39 8E 1239
28151 80 00 C6 14 A6 80 8D BD 8C C0 1302
28161 00 26 F7 39 86 3F A7 8C B7 8E 1171
28171 80 00 C6 14 A6 80 8D AF 1F 10 1003
28181 C4 FF 26 03 6A 8C A5 8C C0 00 1235
28191 25 EC 39 8E 80 00 86 3F A7 8C 1104
28201 97 C6 14 86 3F 8D 8C 4F 8D 89 1204
28211 C6 14 A6 80 8D 89 1F 10 C4 03 1036
28221 26 F4 6A 8D FF 7E 26 EE 39 00 1243
28231 00 00 00 10 8E 01 90 86 FF A7  859
28241 8C F3 86 01 A7 8C EF A7 8C ED 1608
28251 A7 8C EB 6A 8C E6 26 0C 8D 24 1245
28261 86 78 A7 8C DD 31 3F 26 01 39  990
28271 6A 8C D6 26 07 8D 17 86 3C A7 1030
28281 8C CD 6A 8C CB 26 DE 8D 0F 86 1344
28291 1E A7 8C C2 20 D5 86 3F 20 0A 1015
28301 86 0A 20 06 6A 8C B2 A6 8C AF 1087
28311 17 FF 07 4F 17 FF 03 39 00 00  702

 OVERALL CHECKSUM TOTAL 36405
```

The MULTIPLEXER CONTROL LINES are governed by the Dragon locations $FF01, $FF03 and $FF23. The appropriate $FF01 and $FF03 settings can be carried out for us by using a BASIC ROM routine at address $BD41. It requires the sound source to be set up in Register B, the sound sources being:

$00 DAC
$01 Cassette
$02 Cartridge port

Bit 3 ($08) of location $FF23, the SOUND ENABLE BYTE, then needs to be set=1. When we have finished using sound, this bit needs to be unset, that is, made zero, but no equivalent to selecting the sound is needed. Sound source: Turn DAC sound source on (object code $6D84-$6D94) and turn DAC sound source off (object code $6D95–$6DA0):

```
*********************************
********* SUBROUTINES **********
*********************************

*** turn DAC sound source on ***
SNDON  PSHS  D,U
       LDB   #ESDAC
       JSR   ESSEL
       LDB   EENAB
       ORB   #EENON
       STB   EENAB
       PULS  D,U,PC

*** turn DAC sound source off **
SNDOFF PSHS  A
       LDA   EENAB
       ANDA  #EENOF
       STA   EENAB
       PULS  A,PC
```

Sound Subroutine

Sound is actually caused by writing a series of different values to the DAC. The PITCH depends upon the frequency, or time, between changing the values, the longer the duration, the lower the pitch. The VOLUME emitted depends upon the *difference* between the consecutively written values, the greater the difference, the louder the noise, the loudest being created by writing 0 and 63 alternatively. Thus, a value of 20 followed by a value of 25 gives the same **loudness** as writing a value of 0 then 5 or 58 then 63. The DAC is address location $FF20.

Only 6 of the 8 bits of the DAC byte are used in creating sound, hence the range of values being 0-63, thus:

7	*6*	*5*	*4*	*3*	*2*	*1*	*0*	*bit number*
128	*64*	*32*	*16*	*8*	*4*	*2*	*1*	*bit value (decimal)*
×	×	*1*	*1*	*1*	*1*	*1*	*1*	

value 63 ($3F)

However, the six bits used for sound in the DAC byte are not bits 0-5 but 2-7. Furthermore, bits 0 and 1 are used by the Dragon for other things and must not be altered by our routines. The source code to do this is as follows, the actual value being set up for the routine in Register A (object code $6DA1-$6DB4):

```
***** make sound in Reg.A ******
SOUND  PSHS  A
       ASLA
       ASLA
       PSHS  A
       LDA   EDAC
       ANDA  #$03
       ORA   0,S
       STA   EDAC
       LEAS  1,S
       PULS  A,PC
```

The PITCH SUBROUTINE is quite simply a DELAY LOOP (ie FOR N=1 to 500:NEXT). It is the time to be idled away before writing the next value to the DAC. The longer the delay, the lower the pitch of the current sound being made. The source to do this is as follows, the delay count being set up for the routine in Register B (object code $6DB5–$6DBB):

```
***** pitch (delay=Reg.B) ******
PITCH  PSHS  B
PITCHD DECB
       BNE   PITCHD
       PULS  B,PC
```

Figure A

```
Listing 2

1 REM HEXLOADER WITH CHECKSUM
2 REM PAM D'ARCY (C) 1984
3 CLEAR200,28001:B=10
4 PA=128:PS=193:PC=131+(B*2)
5 DIM H(B*2),M(B)
6 CLS:PRINT"HEX LOADER PROGRAM":PRINT
7 INPUT"START ADDRESS";A
8 IF A=0 THEN END
9 CLS:C=0:E=0:PE=PS:P$=CHR$(128)
10 PRINT@PA,A;"($";HEX$(A);")"
11 PRINT@PC,"CHKSUM"
12 IF E=0 AND PE=PS+(B*2) THEN 30
13 IF E<>0 THEN PRINT@PS+E,""
14 PRINT@PE+E,P$:S=PE-PS
15 K$=INKEY$:IF K$="" THEN15
16 IF S=B*2 THEN22
17 IF K$<"0" THEN22
18 IF K$<":" THEN K=VAL(K$):GOTO21
19 IF K$<"A" THEN15
20 K=ASC(K$)-55:IF K<10 OR K>15 THEN24
21 H(S)=K:PRINT@PE,K$;:K$="":PE=PE+1:GOTO12
22 IF K$=CHR$(12) THEN6
23 IF K$=CHR$(8) AND S<>0 THEN PE=PE-1:GOTO12
24 IF E=0 THEN15
25 IF K$=CHR$(09) AND S=B*2 THEN 29
26 IF K$=CHR$(09) THEN PE=PE+1:GOTO12
27 IF K$=CHR$(13) THEN31
28 IF K$="S" THEN PE=PS+(B*2) ELSE GOTO12
29 PRINT@0,"":PRINT@PS+E,""
30 PRINT@PE,"":PRINT@PE,"";:INPUT C
31 N=0:FOR S=0 TO B-1
32 M(S)=(H(S+S)*16)+H(S+S+1)
33 N=N+M(S):NEXT S
34 IF N<>C THEN37
35 FOR S=0 TO B-1
36 POKE A,M(S):A=A+1:NEXT S:GOTO9
37 PRINT@0,"CHECKSUM ERROR - EDIT"
38 PRINT@PS+(B*2)," ";
39 E=32:PE=PS:P$=CHR$(94):GOTO12
40 REM*************************
41 REM OVERALL CHECKSUM CHECK
42 T=0:FOR N=28001 TO 28320
43 T=T+PEEK(N):NEXT N
44 PRINT T:END
45 REM*************************
46 REM RECHEEK LINE CHECKSUMS
47 N=28001
48 T=0:FOR N=N TO N+9
49 T=T+PEEK(N):NEXT N
50 PRINT N-10;T
51 K$=INKEY$:IF K$="" THEN51
52 IF K$="R" THEN RUN ELSE48
```

The NOISE SUBROUTINE makes SOUND in Register A with PITCH in Register B). Pitch is needed quite often, but not always, which is why SOUND is supplied as a separate routine. The NOISE routine simply calls both SOUND and PITCH subroutines. Source (object code $6DBC-$6DC0):

```
** make sound(A) with pitch(B) *
NOISE  BSR   SOUND
       BSR   PITCH
       RTS
```

Having put these sounds together, even I cannot understand why they actually sound as they do. Apparently, a lot of it is to do with the ear making what it can of the air waves sent to it — the air waves being altered by the values written to the DAC (which causes changes in its voltage) and the rate at which the values are written. I suggest that if your understanding of sound is as non-existent as mine, you, too, simply experiment with values until you come up with something that sounds right to you.

My version of **LASER ZAP** is created by repeating the same **loudness** of noise by writing a pair of values alternately (in this instance, the loudest possible, 63 then 0) but increasing the **duration** from 1 (LDB #1) by 1 (INCB) between the repetitions, thus smoothly lowering the pitch. I end the sound when the duration count reaches 200 (CMPB #200). Experiment yourself with loudness and pitch and you may find a ZAP that you like better. Source (object code $6DCB-$6DD9):

```
*********************************
************ LASER *************
*********************************
LASER  LDB   #1
LASERL LDA   #63
       BSR   NOISE
       CLRA
       BSR   NOISE
       INCB
       CMPB  #200
       BNE   LASERL
       RTS
```

I don't know the official definitions of laser zap or phaser noises, but to me, sounds that I have heard described as phasers seem simply to be more or less a repetitive, whippier type of zap. For fuller appreciation, the routine repeats the sound cycle five times (LDY #5). You may like to vary this value.

My version of a phaser runs through a cycle of gradually reducing volume levels, starting at the maximum (PHASEB LDA #63), decreasing by 1 (DEC VLEVEL,PCR) until a starting level of zero is arrived at. Duration (=pitch) is not used. Instead, after writing the starting volume to the DAC, that individual sound is modified by writing a further series of values to the DAC, the series being the start volume level (PHASEC BSR SOUND) reduced by 1 (DECA) until it reaches zero. Different types of phasers can be achieved (fast/slow/loud/quiet) by varying values. Source (object code $6DDA-$6DF5): **(Figure B)**

Explosions tend to sound ragged, or crackly, to the ear and they tend to fade away over the duration. You could set up your own crackly sound value sequence that decreases in volume as it progresses, but a popular idea is that of using a chunk of fairly random values in the Dragon memory — and where better to find a mass of readily available assorted values than program instructions — notably, the BASIC INTERPRETER (ROM) which is always there?

The following program — BASIC ROAR — will give a noise akin to the sheet of crackly sound heard when moving a TV or radio tuner between stations. This is known as 'white noise'. The sound generated by the BASIC ROAR, for all practical purposes, can be termed 'white noise', although the purists will disagree. It is an excellent basis for explosions.

Fig A
USING THE HEX LOADER PROGRAM (HEXLOADR) (Listing 2). The program assists in speedy but accurate entry of machine code data by use of a CHECKSUM after every 10 bytes. It also contained an EDIT facility so that a whole line of data doesn't need to be re-entered because of an odd typing slip. Any amount of data may be entered in one session, allowing you to pick up and put down programme entry as suits your mood or convenience. Type in the prog ram and save it. RUN.

Input the starting address for the code to be entered — 28001 or the restart point if continuing from a previous session. Input each line of the hex dump (listing 1) as a stream of 20 consecutive hex characters (0-9,A-F). The space character between each pair of hex characters (=1 byte) is for easier reading and checking and is not to be typed in.

After entering the last pair of character in a line, the checksum is types in and <ENTER> pressed. If the data entered agrees with the checksum, the values are POKEd into the designated memory locations and the screen prompts the next address. Pressing <CLEAR> at any time abandons any current line being entered and returns you to the 'START ADDRESS' screen. Enter an address of zero to terminate the program.

Should the checksum check fail, EDIT mode is entered, allowing you to use the left and right arrow keys to position the editor's up arrow marker below any offending characters and to overtype them with correct values. <S> instantly positions you at the checkSum value should that be where the error lies. When editing is complete, press <ENTER> for the line to be rechecked again, etc.

At any time that you wish to cease program data entry, mark listing 1 to indicate the restart point. Save the code (CSAVEM"SND1etc",28001,28320,28001). Strictly speaking, you need only to save the data entered so far, but always using the final CSAVEM command helps avoid unwitting errors.

When you wish to continue programe data entry, reserve machine code memory (CLEAR200,28000). CLOADM the last saved disassembler program data file, CLOAD the BASIC hex loader program, RUN and input the marked restart point as the start address, etc.

Once the program data is fully entered, as a further precaution, particularly if loaded over more than one session, check the overall checksum by exiting from the hex loader and type in RUN42<enter>. This will tot up the values in locations 28001/28320 inclusive and display the total. The overall checksum is 36405. If it does not agree, RUN47 will proceed to tot up and display each line's checksum total. In this phase, once you spot a discrepancy, ↵R→ will re-RUN the hex loader program (press any other key to continue the tot up process).

Once a clean bill of health is confirmed, save the program, CSAVEM "SOUNDBOX",28001,28320,28001.

Hex loader adjustments

Adjust the hex loader CLEAR (line3) and checking routines addresses (lines 42,47) if you wish to set up the program data at a lower address (you can always adjust its final loading position by CLOADM with offset and CSAVEM from that point once the program has been entered).

HEXLOADR may be of use for other similarly set up hex dumps — but they may not be 10 bytes per checksum. Adjust B=10 (line3) as appropriate — the program will cope with a maximum of 13 bytes per line without needing further amendment. Should the checksum value be given in hex (this dump has a decimal value), it can be entered using the standard BASIC facility (as can starting addresses presented in hex) of prefixing it with &H.

```
*********************************
*********** PHASER *************
*********************************
VLEVEL FCB   0
PHASER LDY   #5
PHASEB LDA   #63
       STA   VLEVEL,PCR
PHASEC BSR   SOUND
       DECA
       BNE   PHASEC
       DEC   VLEVEL,PCR
       LDA   VLEVEL,PCR
       BNE   PHASEC
       LEAY  -1,Y
       BNE   PHASEB
       RTS
```

Figure B

I have started from ROM address $8000 (ROAR LDX #EROAR), given each sound a duration of 20 (LDB #20), continuing until address $C000 (CMPX #EROARE) is reached. You may well realise that the potential maximum value contained in a byte is 255, so the maximum volume of 63 may be exceeded. The SOUND routine lops off the two most significant bits of the value passed to it in Register A when it repositions bits 0-5 to bits 2-7 for the DAC byte, so a maximum value of 63 is still written. This may be used to good effect deliberately in creating sounds by running through a series that exceeds 63 (after 63, the next value will be 0 etc). Source (object $6DF6-$6E04):

```
*********************************
******** THE BASIC ROAR ********
*********************************
ROAR   LDX   #EROAR
       LDB   #20
ROARD  LDA   ,X+
       BSR   NOISE
       CMPX  #EROARE
       BNE   ROARD
       RTS
```

The fade of an explosion is known as 'noise decay'. What we need to do is to ensure that the maximum volume at any one time is in line with the decay required, be it fast to start, then gradual or whatever.

This example gives a simple, but effective, steady decay over the 16K of the BASIC ROAR ($8000-$C000).

Technically, what is needed is to lop the tops off the spikes of volume that exceed the maximum volume (=difference between consecutive values written to the DAC) of the DECAY LINE.

The easiest method, although if you work out *precisely* what happens you will see that it may actually reshape a sound, is to apply a 'logical AND mask' of the current maximum permissible volume (ie as per the decay line) prior to making each sound. This will ensure that even if the previous value written was zero and the next one is 63 or greater, only the maximum permissible sound at that time will actually be output.

Back to the ROAR, the volume range is 64 (0-63) so if we divide the 16K by the maximum available steps in volume, (1024★16 /64), we need to reduce the permissible volume level after every 256th sound made. The AND mask starts at 63 (EXPLOD) subsequently being reduced (DEC).

Rather than introduce extra count bytes, the current ROM address itself is used to determine when 256 bytes have been written — as the address starts at a 256 byte boundary, every 256th byte written will have an address with the least significant byte=0 (try it), hence the source TFR X,D/ANDB #$FF/BNE EXPLOK. The pitch, or duration, of 20 is retained. Source: FADE ROUTINE (ANDs the value in Register A with the current fade (VFADE,PCR) mask before calling NOISE) — object code $6DC1-$6DCA:

```
**** fade the noise in Reg.A ***
VMASK  FCB    0
FADE   PSHS   A
       ANDA   VMASK,PCR
       BSR    NOISE
       PULS   A,PC
```

EXPLOSION WITH FADE (object code $6E05-$6E21):

```
********************************
****** EXPLOSION WITH FADE *****
********************************
EXPLOD LDA    #63
       STA    VMASK,PCR
       LDX    #EROAR
EXPLOG LDB    #20
       LDA    0,X+
       BSR    FADE
       TFR    X,D
       ANDB   #$FF
       BNE    EXPLOK
       DEC    VMASK,PCR
EXPLOK CMPX   #EROARE
       BLO    EXPLOG
       RTS
```

GUNSHOT can be created by a short explosion sequence, with or without fade, as preferred by you. My version commences with a single burst at the highest volume and fades the noise after every four writes to the DAC, ending when the fade mask is zero. The sound is given a duration of 25. Please excuse the unnecessary second LDA #63 — it doesn't seem worth the effort of reprinting everything and changing addresses within the article for such a small point — but I mention

```
Listing 3
10 REM SOUND SELECTOR
20 EA=28001:EP=EA+3
30 CLS
40 PRINT"SOUND SELECTOR MENU"
50 PRINT
60 PRINT" 1 LASER"
70 PRINT" 2 PHASER"
80 PRINT" 3 BASIC ROAR"
90 PRINT" 4 EXPLOSION"
100 PRINT" 5 GUNSHOT"
110 PRINT" 6 ALARM"
120 PRINT" Q QUIT"
130 PRINT
140 PRINT"SELECT OPTION"
150 K$=INKEY$:IF K$="" THEN150
160 IF K$="Q" THEN END
170 SN=VAL(K$)
180 IF SN<1 OR SN>6 THEN30
190 PRINT SN
200 POKE EP,SN-1
210 EXEC EA
220 GOTO30
```

it as the hawk-eyed readers of *Dragon User* are bound to comment!

Experiment yourself until you have found a gunshot that you are happy with. Source (Object code $6E22-$6E45):

```
********************************
****** GUNSHOT WITH FADE *******
********************************
GUN    LDX    #EROAR
       LDA    #63
       STA    VMASK,PCR
       LDB    #20
       LDA    #63
       BSR    NOISE
       CLRA
       BSR    NOISE
GUNSHT LDB    #20
       LDA    0,X+
       BSR    FADE
       TFR    X,D
       ANDB   #$03
       BNE    GUNSHT
       DEC    VMASK,PCR
       BNE    GUNSHT
       RTS
```

The **FREQUONICS (ALARM)** routine is demonstrating mixing sounds. It shows that you are not limited to setting off a sound and waiting for it to finish before doing something else (be it further sounds or other, for example, graphics, processing). The sound was arrived at purely by experimentation with different values for volumes and durations — I recommend you to dabble further.

This offering is HARMONICS (*not* harmony). Harmonics is the production of sounds of different amplitudes, or volume, or loudness, being output at different frequencies, or repeated at different rates. To keep the sound easier on the ear, the frequencies are multiples of each other (=HARMONICS), that is:

Sound 3 frequency (or pitch or delay) =	*30*
2	*60*
1	*120*

However, as the **volumes** are not as would be expected of harmonics, I have called it FREQONICS. The overall effect is of a warning background buzz with a clanging, bell-like alarm superimposed.

Omission of the BSR FREQS3 line results in the buzzer sound alone. Source (object code $6E46-$6E9E):

```
********************************
***** FREQUONICS (ALARM) *******
********************************
VFREQV FCB    0
VFREQ1 FCB    0
VFREQ2 FCB    0
VFREQ3 FCB    0
FREQ   LDY    #400
       LDA    #255
       STA    VFREQV,PCR
       LDA    #1
       STA    VFREQ1,PCR
       STA    VFREQ2,PCR
       STA    VFREQ3,PCR
FREQA  DEC    VFREQ1,PCR
       BNE    FREQB
       BSR    FREQS1
       LDA    #120
       STA    VFREQ1,PCR
       LEAY   -1,Y
       BNE    FREQB
       RTS
FREQB  DEC    VFREQ2,PCR
       BNE    FREQC
       BSR    FREQS2
       LDA    #60
       STA    VFREQ2,PCR
FREQC  DEC    VFREQ3,PCR
       BNE    FREQA
       BSR    FREQS3
       LDA    #30
       STA    VFREQ3,PCR
       BRA    FREQA
FREQS1 LDA    #63
       BRA    FREQSS
FREQS2 LDA    #10
       BRA    FREQSS
FREQS3 DEC    VFREQV,PCR
       LDA    VFREQV,PCR
FREQSS LBSR   SOUND
       CLRA
       LBSR   SOUND
       RTS
       FCB    0,0
```

Simple experimentation can be speeded up if you know how to use a MONITOR. Even a few lines added to the SOUND MENU PROGRAM to allow you to input an address and POKE a new value is sufficient. I look forward to reading of your sound creations to add to **my** SOUNDBOX in future issues! ■

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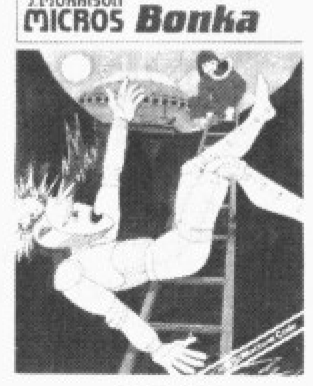
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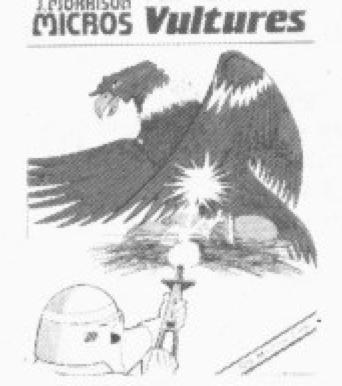
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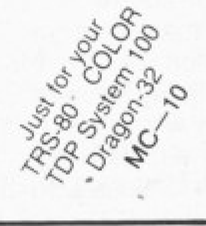
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Heartbeat

From Vince Gledhill in Northumberland

THIS PROGRAM simulates those heart-rate testing machines which are beginning to appear in a variety of shops around the country.

Like the machine it is intended for amusement only and not a serious application. The program is calibrated for the average adult's heart-rate and it should be noted that children's hearts beat faster than an adult's.

```
5 'HEARTBEAT <C> V. GLEDHILL OCT 1984
10 J$=CHR$(128)
20 J2$=J$+J$
30 J4$=J$+J$+J$+J$
40 FOR A=1 TO 5
50 CLS0
60 PRINT@106,"heartbeat";:SOUND100,2
70 FOR G=1 TO 800:NEXT
80 CLS0
90 FORG= 1 TO 800:NEXT
100 NEXT A
110 PRINT@230,"want"J$"intructions";
120 Q$=INKEY$:IF Q$="" GOTO 120
130 IF Q$<>"Y" GOTO 360ELSE 300
140 CLS0
150 PRINT@129,"on"J$"beat"J$"twenty"J$"press"J$"the"J$"space"J2$"bar"J$"again";
160 Q$=INKEY$:IF Q$<>CHR$(32) THEN 160 ELSE 170
170 D=TIMER/50:SOUND 90,2
180 C=INT((20/D)*60)
190 PRINT@262,C;
200 IF C<=60 THEN PRINT@ 358,"athletic";:GOTO 250
210 IF C>61 AND C<70 THEN PRINT@358,"well"J$"conditioned";:GOTO 250
220 IF C>71 AND C<85 THEN PRINT@358,"average";:GOTO 250
230 IF C>86 AND C<100 THEN PRINT@358,"below"J$"average";
240 IF C>=100 THEN PRINT@358,"may"J$"need"J$"exercise";
250 FOR X=1 TO 2500:NEXT X
260 PRINT@422,"want"J$"another"J$"go";
270 Q$=INKEY$:IF Q$="Y" THEN 410 ELSE 280
280 IF Q$<>"N" THEN 270 ELSE END
290 IF Q$="" GOTO 270
300 CLS0
310 PRINT@2,"this"J$"program"J$"calculates"J$"your"J2$;
320 PRINT@33,"heartrate";
330 PRINT@98,"used"J$"properly"J$"it"J$"can"J$"indicate"J2$"how"J$"fit"J$"you"J$
"are";
340 PRINT@194,"but"J$"remember"J$"your"J$"heartrate"J4$"can"J$"alter"J$"dramatic
ally"J$"after"J4$"exercise"J$"or"J$"at"J$;
350 PRINT"times"J$"of"J$"stress"J$;
360 PRINT@322,"locate"J$"your"J$"pulse"J$"and"J$"leave"J4$"your"J$"finger"J$"the
re"J$;
```

Continued on page 31

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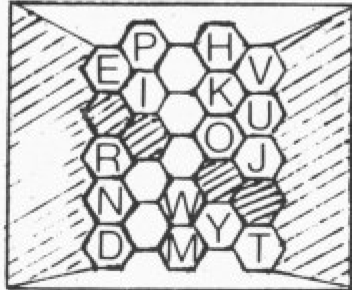
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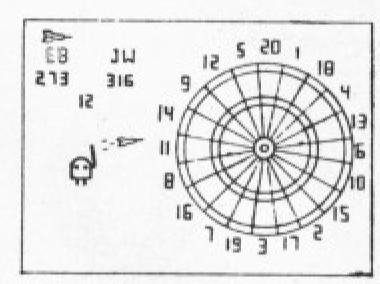
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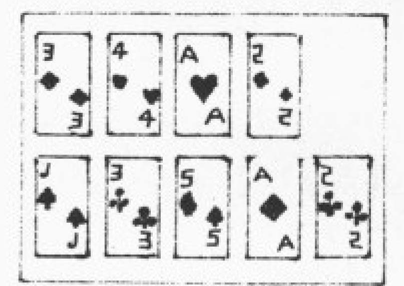
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Continued from page 29

```
370 PRINT"then"J$"press"J4$"the"J$"spacebar"J$"and"J$"start"J$"counting"J$"the"J
$"beats";
380 Q$=INKEY$:IF Q$<>CHR$(32) THEN 380
390 TIMER=0:SOUND80,2
400 GOTO 140
410 CLS0:GOTO360
```

Conversion

From P Howarth in Manchester

CONVERSION is a simple program to convert numeric measurements of one form into its equivalent number in another.

This program will convert inches to centimetres, feet to metres, miles to kilometres, gallons to litres, ounces to grammes, pounds to kilograms and fahrenheit to centigrade.

```
10 REM***** P. HOWARTH *****
20 CLS
30 PRINT"WHICH CONVERSION DO YOU R
EQUIRE?";
40 PRINT
50 PRINT"(1)  INCHES - CENTIMETRES
"
60 PRINT"(2)  CENTIMETRES - INCHES
"
70 PRINT"(3)  FEET - METRES"
80 PRINT"(4)  METRES - FEET"
90 PRINT"(5)  MILES - KILOMETRES"
100 PRINT"(6)  KILOMETRES - MILES"
110 PRINT"(7)  GALLONS - LITRES"
120 PRINT"(8)  LITRES - GALLONS"
130 PRINT"(9)  OUNCES - GRAMMES"
140 PRINT"(10) GRAMMES - OUNCES"
150 PRINT"(11) POUNDS - KILOGRAMS"
160 PRINT"(12) KILOGRAMS - POUNDS"
170 PRINT"(13) FAHRENHEIT - CENTIG
RADE"
180 INPUT A
190 IF A<1 OR A>13 THEN GOTO 180
200 ON A GOSUB 260,340,420,500,575
,650,730,810,890,970,1050,1130,121
0
210 PRINT@448,"ANOTHER CONVERSION
(Y/N)?"
220 A$=INKEY$
230 IF A$="" THEN GOTO 220
240 IF A$="Y" THEN GOTO 20
250 CLS:STOP
260 CLS
270 PRINT@166,"INPUT INCHES ";
280 INPUT IN
290 LET CM=IN * 2.54
300 PRINT@197,IN;" * 2.54 = ";CM
310 PRINT@230,"CM = ";CM
320 FOR X=0 TO 15000:NEXT X
330 RETURN
340 CLS
350 PRINT@166,"INPUT CENTIMETRES "
;
360 INPUT CM
370 LET IN=CM / 2.54
380 PRINT@197,CM;" / 2.54 = ";IN
390 PRINT@230,"IN = ";IN
400 FOR X=0 TO 15000:NEXT X
410 RETURN
420 CLS
430 PRINT@166,"INPUT FEET ";
440 INPUT F
450 LET M=F * 0.3048
460 PRINT@197,F;" * 0.3048 = ";M
470 PRINT@230,"M = ";M
480 FOR X=0 TO 15000:NEXT X
490 RETURN
500 CLS
500 CLS
510 PRINT@166,"INPUT METRES ";
520 INPUT M
530 LET F=M / 0.3048
540 PRINT@197,M;" / 0.3048 = ";F
550 PRINT@230,"FT = ";F
560 FOR X=0 TO 15000:NEXT X
570 RETURN
575 CLS
580 PRINT@166,"INPUT MILES ";
590 INPUT ML
600 LET KM=ML * 1.6093
610 PRINT@197,ML;" * 1.6093 = ";KM
620 PRINT@230,"KM = ";KM
630 FOR X=0 TO 15000:NEXT X
640 RETURN
650 CLS
660 PRINT@166,"INPUT KILOMETRES ";
670 INPUT KM
680 LET ML=KM / 1.6093
690 PRINT@197,KM;" / 1.6093 = ";ML
700 PRINT@230,"ML = ";ML
710 FOR X=0 TO 15000:NEXT X
720 RETURN
730 CLS
740 PRINT@166,"INPUT GALLONS ";
750 INPUT GAL
760 LET LIT=GAL * 3.7854
770 PRINT@197,GAL;" * 3.7854 = ";L
IT
```

Continued on page 33

Continued from page 31

```
780 PRINT@230,"LITRE = ";LIT
790 FOR X=0 TO 15000:NEXT X
800 RETURN
810 CLS
820 PRINT@166,"INPUT LITRES ";
830 INPUT LIT
840 LET GAL=LIT / 3.7854
850 PRINT@197,LIT;" / 3.7854 = ";G
AL
860 PRINT@230,"GAL = ";GAL
870 FOR X=0 TO 15000:NEXT X
880 RETURN
890 CLS
900 PRINT@166,"INPUT OUNCES ";
910 INPUT OZ
920 LET G=OZ * 28.35
930 PRINT@197,OZ;" * 28.35 = ";G
940 PRINT@230,"GRAMMES = ";G
950 FOR X=0 TO 15000:NEXT X
960 RETURN
970 CLS
980 PRINT@166,"INPUT GRAMMES ";
990 INPUT G
1000 LET OZ=G / 28.35
1010 PRINT@197,G;" / 28.35 = ";OZ
1020 PRINT@230,"OUNCES = ";OZ
1030 FOR X=0 TO 15000:NEXT X
1040 RETURN
1050 CLS
1060 PRINT@166,"INPUT POUNDS ";
1070 INPUT LB
1080 LET KG=LB * 0.4536
1090 PRINT@197,LB;" * 0.4536 = ";K
G
1100 PRINT@230,"KG = ";KG
1110 FOR X=0 TO 15000:NEXT X
1120 RETURN
1130 CLS
1140 PRINT@166,"INPUT KILOGRAMS ";
1150 INPUT KG
1160 LET LB=KG / 0.4536
1170 PRINT@197,KG;" / 0.4536 = ";L
B
1180 PRINT@230,"POUNDS = ";LB
1190 FOR X=0 TO 15000:NEXT X
1200 RETURN
1210 CLS
1220 PRINT@166,"INPUT FAHRENHEIT "
;
1230 INPUT FA
1240 LET CE=(FA-32)*(5/9)
1250 PRINT@197,"(";FA;"-32)*(5/9)
= ";CE
1260 PRINT@230,"CENTIGRADE = ";CE
1270 FOR X=0 TO 15000:NEXT X
1280 RETURN
```

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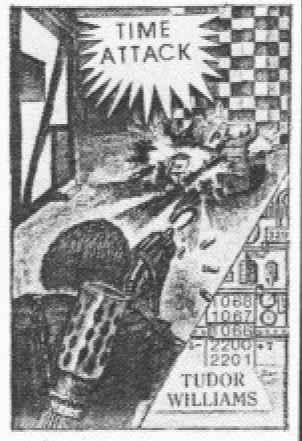
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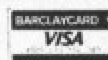
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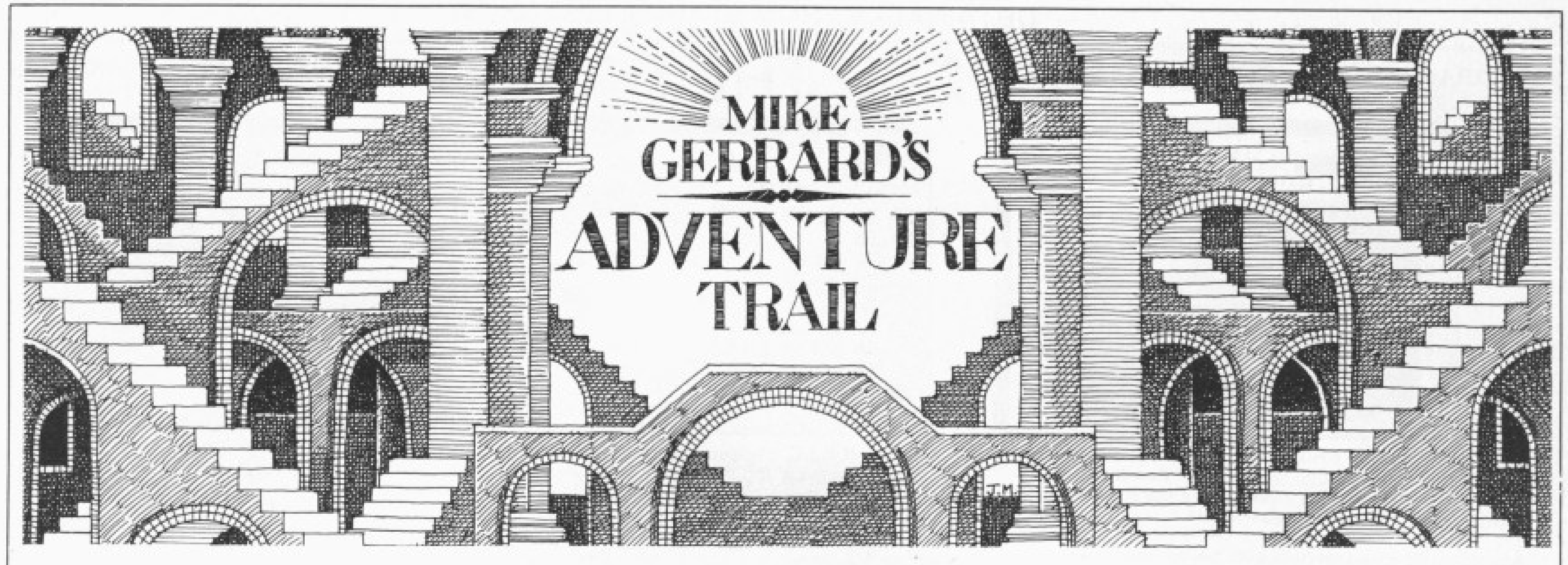
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I'LL BEGIN with a grovelling apology to reader Rosalind Redwood of Bristol, who I mentioned in the January issue as having problems with *Calixto Island* — she couldn't get the treasure back because the transporter disappeared when she'd bartered with Trader Jack for the keys. I dared to suggest that maybe Rosalind hadn't found the treasure after all, but some jewellery that appears earlier in the game, basing this on the fact that you need the machete from Trader Jack to find the treasure, not the keys.

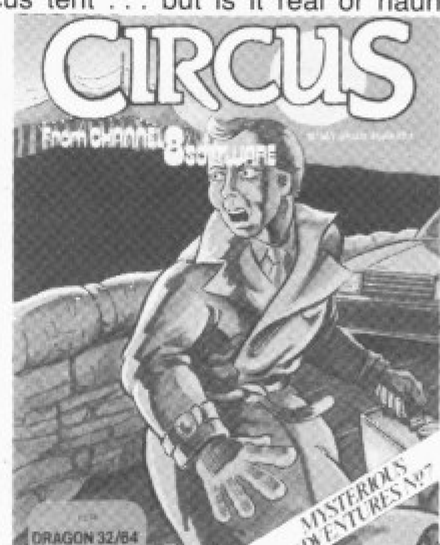
In fact, Rosalind had already done that, but found, as did other readers, that a second trade caused the transporter device to disappear. So, how do you get round it? Well it seems to depend on the order in which you trade. If you find the treasure, then attempt to trade for the keys, the device goes. If you get the keys, return to open the desk and read the notes, then go back for the machete and continue to find the treasure, the device will still be there. Sorry for the slur on your status as an adventurer, Rosalind.

A letter this month from Kerry O'Sullivan, with no address but containing the proud announcement that after twelve months' hard labour, Kerry too has completed *Calixto Island*, having had trouble with the professor's notes. John Martin has sorted out *Calixto Island* and polished off *Black Sanctum*, finding the latter rather disappointing, but he's now stuck in *Madness and the Minotaur*. John's problem is finding the oil for the lamp. So, if you can spare clues, or even some oil, write to John at 114 Blackmead, Orton Mulborne, Peterborough, Cambs. John's also finished *El Diablero*, "after a lot of frustration and dead crows," he says, so maybe you can swop tips with him.

Another reader in need of help is Pauline Hampson of 10 Cherry Lane, Lawton Heath, Alsager, Stoke-on-Trent ST7 3QZ. Pauline is one treasure short in *Keys of the Wizard*, and not even Microdeal can help her. She doesn't say which treasures she's found, but if anyone can help do write to her. In return Pauline can help with the dreaded *El Diablero* and *Calixto Island*, and says she can recommend Channel 8's *Time Machine*.

I'm afraid I can't recommend Channel 8's *Circus* as highly as some of the others in the Mysterious Adventure series. I haven't had time or space to look at them all yet, but I loaded up *Circus* the other evening to see what it was about. The following evening I finished it, without the aid of a safety net! In fact that's misleading, you do need the aid of a safety net, and a few SAVEs here and there, but with only about 33 locations it's not the hardest adventure you'll ever have to tackle.

The story is that your car has run out of petrol on a lonely country road . . . dear me, the mishaps that happen to us innocent adventurers. As you go trudging over the fields and roads you come across a circus tent . . . but is it real or haunted?



And where's the light that enables you to see inside? There's a cage containing a sleeping tiger, and a tank containing a seal, so with just these two creatures and a solitary clown is it any wonder the circus closed down? Take care going up to the trapeze and the tightrope, and once you've found a source of light you shouldn't hang about as its life is limited.

The adventure sets you two main problems. One is in finding just the right words to solve a particular problem, and this to my mind is not what adventures are about. You know what you want to do, but what are the exact words the program's looking for. In *Circus* there's a chest which you know you must have to open, but after OPEN CHEST, HIT CHEST, BASH CHEST, and a dozen other attempts I was about to give up. When I eventually discovered what you had to do I could have kicked the programmer.

The other problem *Circus* sets is that you only have a certain number of moves before your light runs out, and also a certain number when you get into the end sequence, so you must work out the most economic way of moving things around and solving problems. When I did it I was on my very last turn as I issued, with fingers crossed, what I hoped was the final command. By the skin of my teeth then, I did it, but I hoped for more than a few hours of entertainment from a £9.95 adventure. Fortunately, not all Channel 8's are so simple, and I did have a letter recently from a reader who enjoyed *Circus* a great deal, so make your own minds up about that.

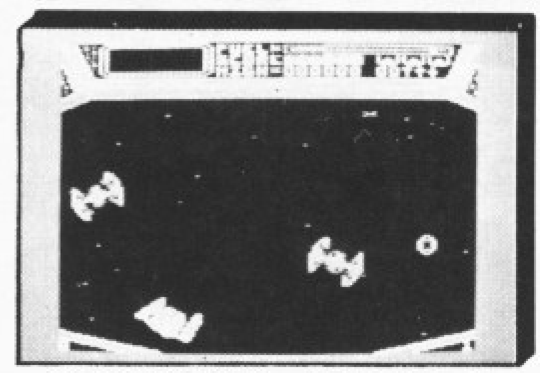
Maybe I'm just in a grouchy mood this month, because I didn't like the other adventure much either! This was *Terror Castle* from Quickbeam Software, whose title *The Shrunken Scientist* impressed me last time. When I loaded up this one though it looked rather familiar, and sure enough it was an adventure that had been published and then withdrawn last year under the title *Horror Castle*. Your objective is to rescue a beautiful princess from said castle, so I don't know whether this will appeal to the many female adventurers I get letters from (it's the only reason I write the column!).

What won't appeal to anyone is the lack of a SAVE feature, particularly as the game takes a delight in killing you off without warning. This doesn't matter too much early on, but when you're well into the adventure you don't want to discover that you've stepped through a door and fallen 100 feet into the moat so you have to start again. The location descriptions are very brief, with no atmosphere at all — well, how can you have atmosphere when you find in this creaky old castle a table which has a drawer requiring a combination to unlock it? The combination is on a card elsewhere, and it's typical of the lack of logic that you can't read the card in any location other than the one where the table is. Why on earth not?

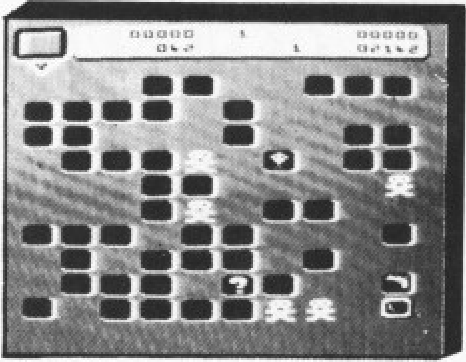
I had been hoping to include reviews of the two new ones from Adventure International, *Spiderman* and *The Sorceror of Claymorgue Castle*, but the review copies haven't arrived. They'll be here next month, though, if I have to trek to Birmingham cap in hand. Goodness, I might even buy them. Don't tell the editor, though, or I'll be drummed out of the Reviewers' Union. ■

OBTAINABLE FROM STAND 8 6809 SHOW

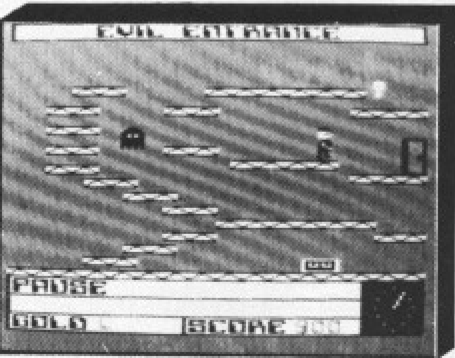
DRAGON 32 **1·99** **WE FEED THE DRAGON** **3·99** TANDY



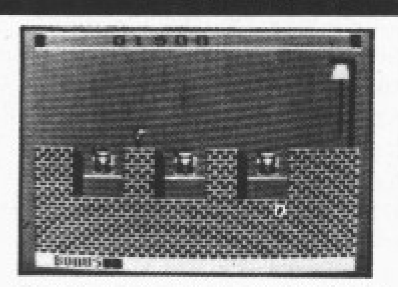
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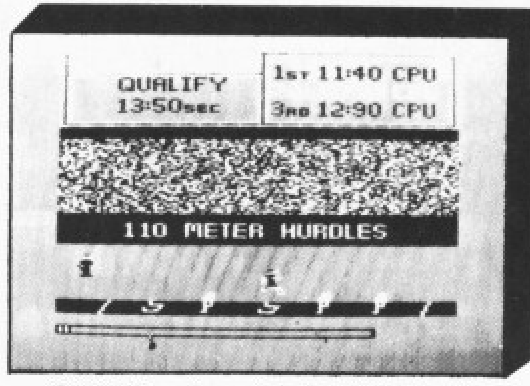
RUBY ROBBA — There is a complex defence system guarding the precious ruby. Snakes, guards and mines. You have only one minute to carry out the operation but you can do it, I know you can. *Tandy Colour* £3.99



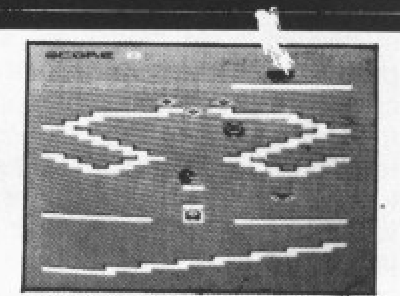
MORBID MANSION — Ten rooms in this old mansion must be negotiated before you come face to face with the dreaded Morbid. You are alone then suddenly the clock gets to 12! 10 screens arcade adventure. JS. £3.99



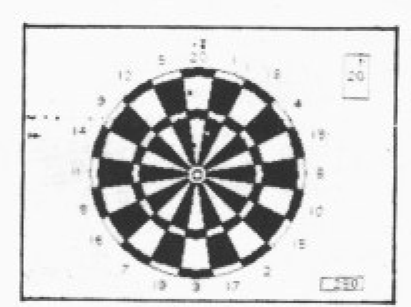
THE BELLS — You have probably read the novel or seen the film — now you can play the game. Rescue Esmeralda from the bell tower. 14 screens of danger for you to challenge. JS/KB. £1.99



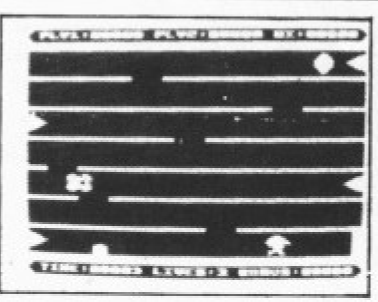
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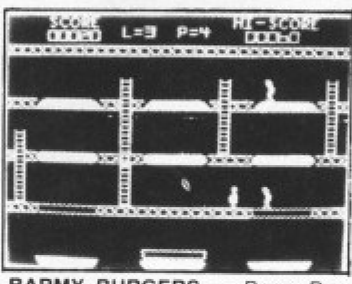
PERILOUS PIT — Deep underground in the crystal mines roams the dreaded Orbis and his cronies, who are hell bent on stopping the attempts of Boris the miner to fill his truck full of crystals — four screens. JS. £1.99



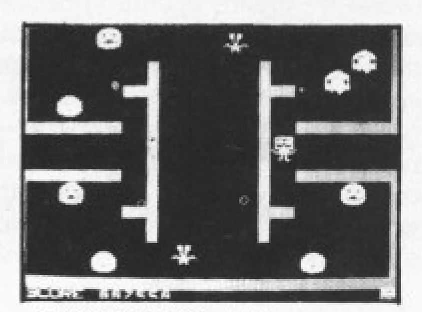
DARTS — Open a couple of cans of beer, sit back, and get all the excitement of an evening in the local. JS. £1.99



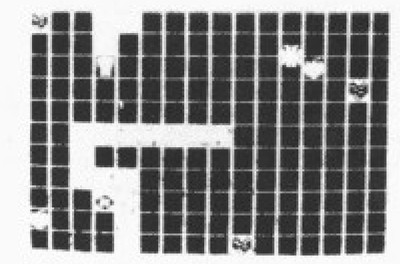
BORIS THE BOLD — Urgent telegram for Boris. Stop. Please come home. Stop. Beware of the patrollers, lasers and bombs. Stop. Please grab a few diamonds on your way. Stop. JS. *TANDY COLOUR* £1.99



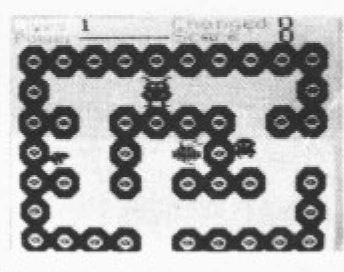
BARMY BURGERS — Baps, Burgers, Cheese and Lettuce. They are all there all you have to do is put them together — sounds easy doesn't it — but not when you are being chased by a fried egg and sausages. JS. £1.99



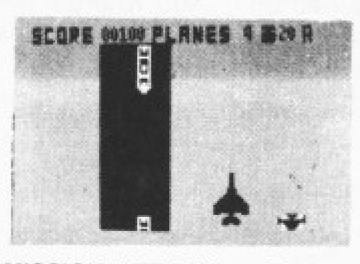
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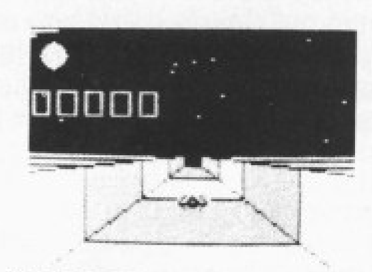
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I want to wish your company the very best with this cassette, it deserves to be a No. 1 seller.

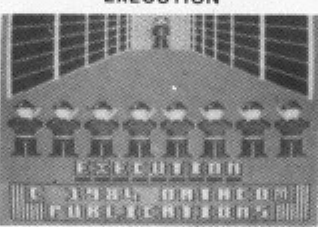
Yours sincerely
Mr C Davis
W. Midlands

INTERPLANETARY TRADER



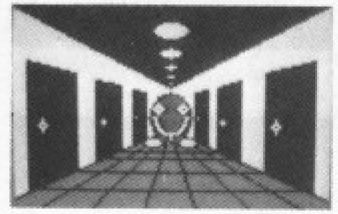
Pirate Attack! Just one of the many hazards encountered as you strive to become first ever GALACTIC MEGABILLIONAIRE! Success depends on ability to make lightning decisions, accurate forward planning. Should you brave the Meteor Storm to save precious time? Pay the oytrageous protection demanded by Space Pirates? This massive 28K game provides compelling entertainment.

EXECUTION



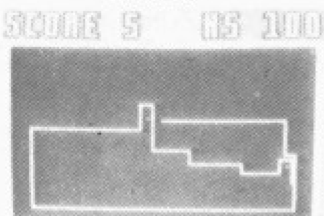
Are you cool, level headed? You need nerves of steel to play EXECUTION. Standing before the awesome firing squad you realise this is your last chance to receive a pardon, but time is fast running out...Features full high res moving graphics and sound. Hours of fun guaranteed in this massive 30K game.

WUMPUS MANSION



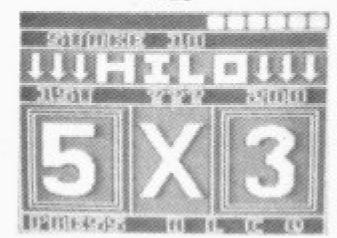
Only a crazy person would go near WUMPUS MANSION. You however, have ventured INSIDE it!!! Tempted by hoards of priceless treasures your mission is to raid the mansion and leave through the maze of tunnels. Will you outwit the dreaded WUMPI?? Can you avoid the time bombs?? Incredible fun!! Uses 29K.

WIPEOUT



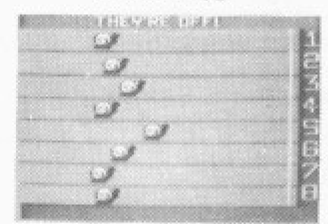
BE WARNED - THIS IS NOT EASY!!
A challenging multilevel graphic game demanding fast, accurate reaction. It begins easily enough, but gets progressively more difficult. Features 4 colour high resolution graphics, sound, bonus points and high score.

HILO



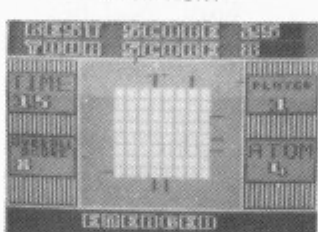
Is it skill or luck? Can you turn your humble £50 stake into £1,000,000?? This simple yet highly compelling game supported by excellent colour graphics and brilliant sound effects. Over 20K of clever programming!

SNAIL PACE



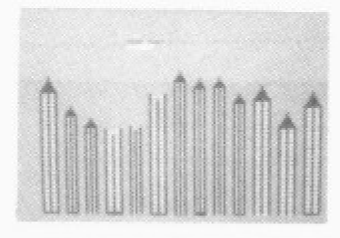
The excitement is almost unbearable as you watch 1-8 'thoroughbred racing snails' thrash it out on the racecourse!! Game features sensible odds and form guide to assist you. This superb piece of complex programming supported by magnificent graphics will ensure hours of excitement. A massive 26K!!

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CHILDREN'S GAMES, primary ages. 2 full-length colourful, amusing graphic adventures on one tape. Rabbit and Gameland. Send £1.99. S. Waites, 7 Gentian Court, Colchester, Essex.

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MACHINE CODE FACT SHEET, Dragon 32. Graphics, sound, adding Basic commands, interrupts, £1.00. SAE. M. Severs, 22 Dallington Close, Hersham, Surrey.

DRAGON 32K COMPUTER assembler games, leads, £55. Suhail, 79 Mayola Road, London E5 0RF. 986 2658.

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If you've got a technical question write to Brian Cadge. Please do not send a SAE as Brian cannot guarantee to answer individual inquiries.

Dragon Answers

Light connections

I AM trying to find out where the X and Y screen locations are kept. I have built a light pen for use with the Vic, but do not know how to program the Dragon to accept inputs from a light pen or even how or where to connect the light pen to the Dragon.

C Tuckwood
19 Holmwood Ave
Plymstock
Plymouth

THE TEXT screen position is stored in locations 136/137. To get the equivalent print @ position, use peek(136) 256+peek(137)−1024.

The graphics x co-ordinate is stored in loc 200, and the current y co-ordinate in loc 202. However, without an interface to the Dragon's cartridge port, the computer can not use light pens which return screen positions, only light sensitive ones which plug into the joystick ports.

What's your number?

I AM looking for a ROM address in the Dragon. Specifically, I am looking for a ROM call subroutine that is called by BASIC's main command interpretation loop — the main loop calls $... (in TRS80 CoCo it is $ADC6), when it is set to execute the next command.

On entry, it is assumed that $A6,$A7 is pointing to the next BASIC command to be executed, and that the A register contains the first byte of that command. After the ROM call returns, this subroutine returns program control to the calling routine with an RTS.

Maarten Van Wamelen
Neth-Belg
3 Lijnmetestraat
Oedelem
8330 Belgium

THE ROM address you need to use on the Dragon is $84A6 hex, or 33958 decimal. This is slightly different from the CoCo routine you mention in that the "A" register need not be set up first.

Locations 166/167 should be set up to point to the start of the tokenised command you wish to execute. Also, note that the Dragon's tokens have different values to the CoCo's.



Read between the lines

I AM the owner of a Dragon 64, Dragon Diskette station and a Microline-80 printer.

When I am using the OS-9 system and trying to write a letter with the Stylograph or the Tutorial letter in the Stylograph my spacing between the lines is too big. The distance between the lines is 10mm and that is too much. I have tried all the Print Codes in the OS-9, but with no results.

Does the Microline-80 printer not work with the OS-9 system? Besides this I have had no problem with the printer. If you have any solution to this problem, please let me know.

I also own a TRS-80, Model I, Level II, with expansion interface 32K. Is it possible to use the Dragon Diskette station on the TRS-80, or do I need any particular connection. I have not used it on the TRS-80, but I can see that the Dragon cable fits in the TRS-80.

John Hagen
Lyngfaret 72a
5071 Loddefjord
Bergen
Norway

IT SOUNDS to me as if your printer is leaving a blank line between each printed line. This is caused by OS-9 outputting both a CR and LF code at the end of each line. You can get over this by altering the dip switches in your printer, if possible, or alternatively, use the following procedure in OS-9: xmode /p −1f (to stop autoline feeding).

From Stylograph spool the output to a file, such as /dO/print, then from OS-9 type: copy /dO/print /p.

To your second question, TRS-80 drives can be used with the Dragondos or Deltados controllers. However, don't try to use any other interface, such as the Coco disk controller, as these will not work.

I can't get no satisfaction

I HAVE been having trouble getting the commands GET and PUT to work. I have written a program which requires a star to move left and right across the screen, but I have been unable to achieve this. I have enclosed the program and would be grateful if you could have a look at it and tell me where I went wrong.

```
10 PMODE 4,1:SCREEN 1,1:PCLS
20 A$ = "BM5,5;CO;R5;C5;F5E5D5
   R5G5F5L5D5H5G5U5L5E5H5R5
   U5"
30 DIM B(35,35):DRAW A$
40 C=3:D=3
50 GET (C,D)-(C+35,D+35),B
60 C=C+1
70 PUT (C,D)-(C+35,D+35),B,PSET
80 GOTO 50
```

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THE GET and PUT commands seem to cause more than their fair share of trouble to users learning Basic. The problem with this program is that the ,G is missing in the GET statement. This should read: GET(C,D)−(C+35,D+35),B,G.

The manual states that the ,G (which instructs full graphical detail to be stored) is optional, but in practice it is usually wise to include it, else the image displayed by PUT can be somewhat unpredictable. There is no need to GET an image more than once, so line 80 can be changed to GOTO 60.

Don't hang up on me

I SEEM to be having problems with the printer port. When I poke data to 65281-2 (which appears to be the printer port) the system "hangs up". This also occurs using LLIST. I am using a "Paper Tiger" centronics interfaced printer.

Could you tell me the correct address for I/O ports (cartridge and printer)? Is the printer port a 6821 PIA "B" port?

D Coombes
28 Buckland Gdns
Calmore
Hants SO4 2SB

THE PRINTER port is addressed as location 65282 only. Poking data to location 65281 is likely to cause the machine to crash, or at least the keyboard to stop operating. If the machine hangs up when you use LLIST then it sounds as if the printer "busy" connection is faulty. Try typing ?PEEK(65314)AND1, which should print a 1 if the printer is ready. If you get a zero with the printer connected, then the "busy" input is not working.

The printer port is a 6821 PIA "B" port.

Error - what error?

USING THE following short program to PEEK through the Basic ROM, I came across the statement "EXTRA IGNORED" at locations 34842 to 34854. Is this an error message?

```
10 FOR A=32768 TO
   49151:B=PEEK (A)
20 IF B 731 AND B 127 THEN PRINT
   CHR$ (B);
30 NEXT A
```

S Moore
7 Birch Ave
Grimsby
South Humberside

THE "EXTRA ignored" message is generated when too many items are entered in an input statement. For example, if you enter 2,3 (enter) when the input command reads INPUT A, this message will be displayed. Unlike other errors it is only a warning, and the program does not stop.

Unfortunately, this is not mentioned in the explanation of the Input command in the manual, or in the errors section.

Competition Corner

Answers to Competition Corner, *Dragon User*, 12-13 Little Newport Street, London WC2H 7PP.

Four Dragon 64s to be won

CAN YOU FIND the two whole numbers which, when multiplied together will come to exactly 1,000,000? Easy? How about adding the stipulation that neither number must contain any zeros. This makes things a bit harder — or even, you may think, impossible. That is unless you happen to hit upon a novel method of approach whereupon the solution becomes simplicity itself.



One million is equivalent to 10 raised to the sixth power — that is 10^6. Now, 10, as well as having factors of 10 and 1, also has factors of 2 and 5. so, just as 10^6 equals one million so too does $(2 * 5)^6$. This can also be written as $2^6 * 5^6$ which works out as 64 times 15,625. Thus we arrive at our answer to two factors of one million, neither containing any zeros.

Puzzles of this type in which the solution is readily apparent but only if you hit upon such a lateral method have become known by the not inappropriate name of 'aha' problems. It was for much the same reason that the concealed sunken fences, popular with landscape gardeners such as Capability Brown and his contemporaries, were called 'ha-ha's' mainly due to the expression of surprise when encounteed for the first time.

Here is another 'aha' of the mathematical kind. Draw an eight inch square, and rule it up into a grid of sixty-four one-inch squares. Now cross out two diagonally opposite corner squares, so leaving sixty-two squares. By taking 31 rectangles of card, each 2 x 1 inches in size, is it possible to completely cover these remaining squares with the cards?

If you were to try to solve this by actual experiment, you might find that your first few attempts failed. By the time that you had had a couple of dozen tries — also equally fruitless — you might reasonably suppose that the solution was difficult if not impossible. But how can it be proved? Of the millions of different ways in which the cards can be placed is there not *one* that will succeed in covering all the squares?

The answer is that it is impossible, and the solution is beautifully simple. Consider the grid to have alternate squares shaded like a chessboard. If this is done the two missing squares will be both of the same colour, either white or black. Now a 2 x 1 card can only cover one square of each colour however it is placed, and once thirty of them have been positioned, the two uncovered squares will be of the same colour, and so cannot both be covered by the remaining card.

Now let's return to our original problem. We have seen how two factors of 10^6 can be found, neither containing any zeros. Are there any other powers of ten that can be similarly expressed? Ten itself has factors of 2 and 5, and one-hundred has factors of 4 and 25. In each case these factors are found by simply raising 2 and 5 to the corresponding power to which we have raised the 10. The results are shown as follows:

$10^1 = 2^1$ times $5^1 = 2$ times 5
$10^2 = 2^2$ times $5^2 = 4$ times 25
$10^3 = 2^3$ times $5^3 = 8$ times 125
$10^4 = 2^4$ times $5^4 = 16$ times 625
$10^5 = 2^5$ times $5^5 = 32$ times 3125
$10^6 = 2^6$ times $5^6 = 64$ times 15626
$10^7 = 2^7$ times $5^7 = 128$ times 78125

Unfortunately 5^8 is equal to 390625, which, as it contains a zero is not admissible, and so 10^8 cannot be so factorised.

This month's competition is to determine how many other powers to ten have two factors which do not contain zeros.

As a hint, and to save any sleepless nights, it has been established by a computer in America that all powers of 2 from 2^{100} to 2^{57134} contain at least one zero, so we need only concern ourselves here with powers up to 100.

Prize

THIS ISSUE Compusense is giving away four Dragon 64s to four lucky winners of this competition.

Rules

TO WIN a Dragon 64 you must both show the answer to the competition and how to solve it with the use of a Basic program developed on your Dragon. Please do not send in a cassette containing the answer. As a tiebreaker complete the following sentence in 15 words or less. "I would like to own a 64 because . . ."

Your entry must arrive at *Dragon User* by the last working day of April. The winners and the solution to the puzzle will be published in our July issue. Entries will not be acknowledged and we cannot enter into correspondence on the result.

January winner

THE CENTRES of the discs should be 2.74233253 inches apart (approximately). The 10 winners, who will each receive six games from Cable Software, are; A Clarke of Wirral, Kevin Desmond of Cork, Boris Leblanc of France, Janice Parry of Wales, Gordon French of Northampton, J Wyver of Woking, I Jolley of Devon, Dominic Brodrick of Tewkesbury, J Promil of Belgium and C Dacre of Preston.

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